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[SPECIAL ISSUE]

FAST FORWARD 2010 THE FATE OF I.T.

Will CIOs Disappear?
Will Software Ever Be Free?
Will the U.S. Become an IT Backwater?
Is the Internet Heading for Total Collapse?

SEE WHAT LIES AHEAD...and Perhaps What You Can Do to Help Forge a Better Future
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Plus
LESTER THUROW
On Shaping Globalization [Before It Shapes Us]
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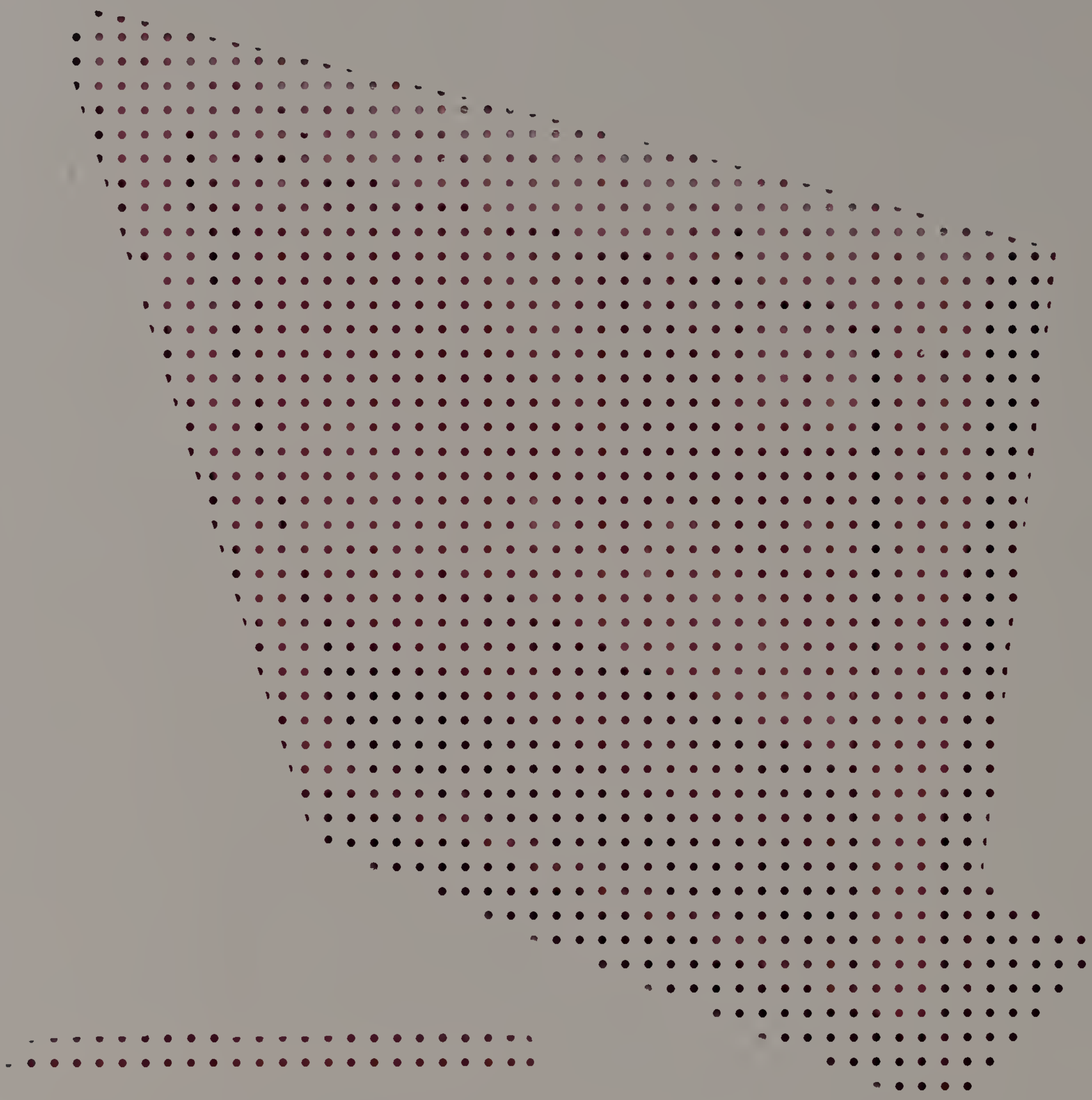

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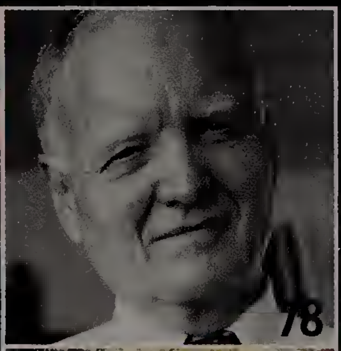
THE FATE OF I.T.



MIT economist Lester Thurow (top) says to be strong globally, the U.S. needs to be strong locally. Intel CIO Doug Busch (bottom) wants the government to invest in innovation.

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THE FUTURE OF JOBS AND INNOVATION

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Even though some IT jobs will continue to move overseas, by 2010 the United States will still have a sizable population of IT professionals doing high-level work on strategy, implementation and design.

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If we continue to move jobs offshore, the U.S. IT professional could become extinct.

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By Scott Berinato

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Is Your Future Written? | 12

To shape the future, CIOs and other execs need to make choices that demand real moral courage in the face of powerful forces. *By Abbie Lundberg*

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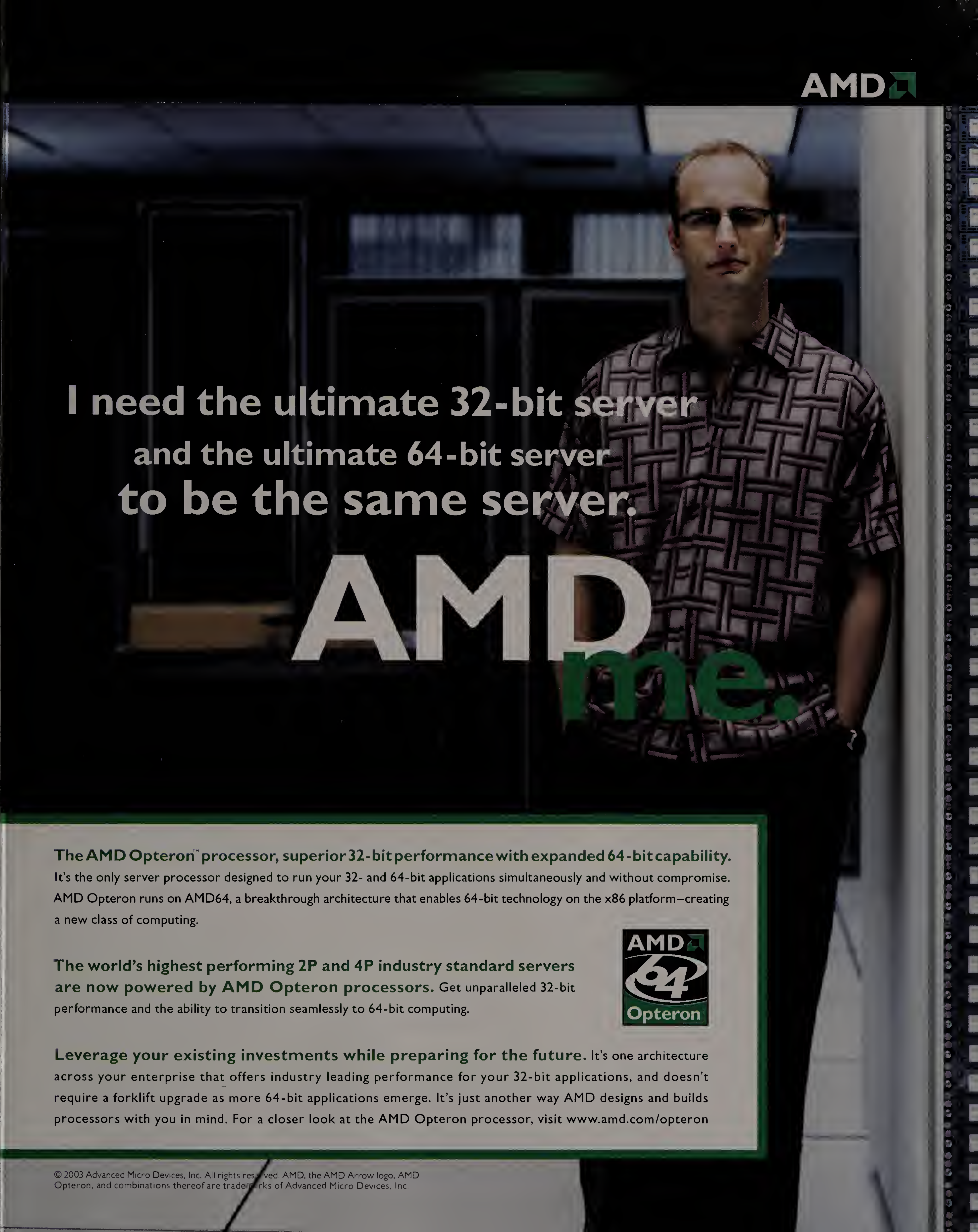
> **"The Bangalore help desk seems fluent in English—finally. At least, I don't hear complaints about it anymore."**
>
> –Michael Schrage, "A Memo from the Future" Page 38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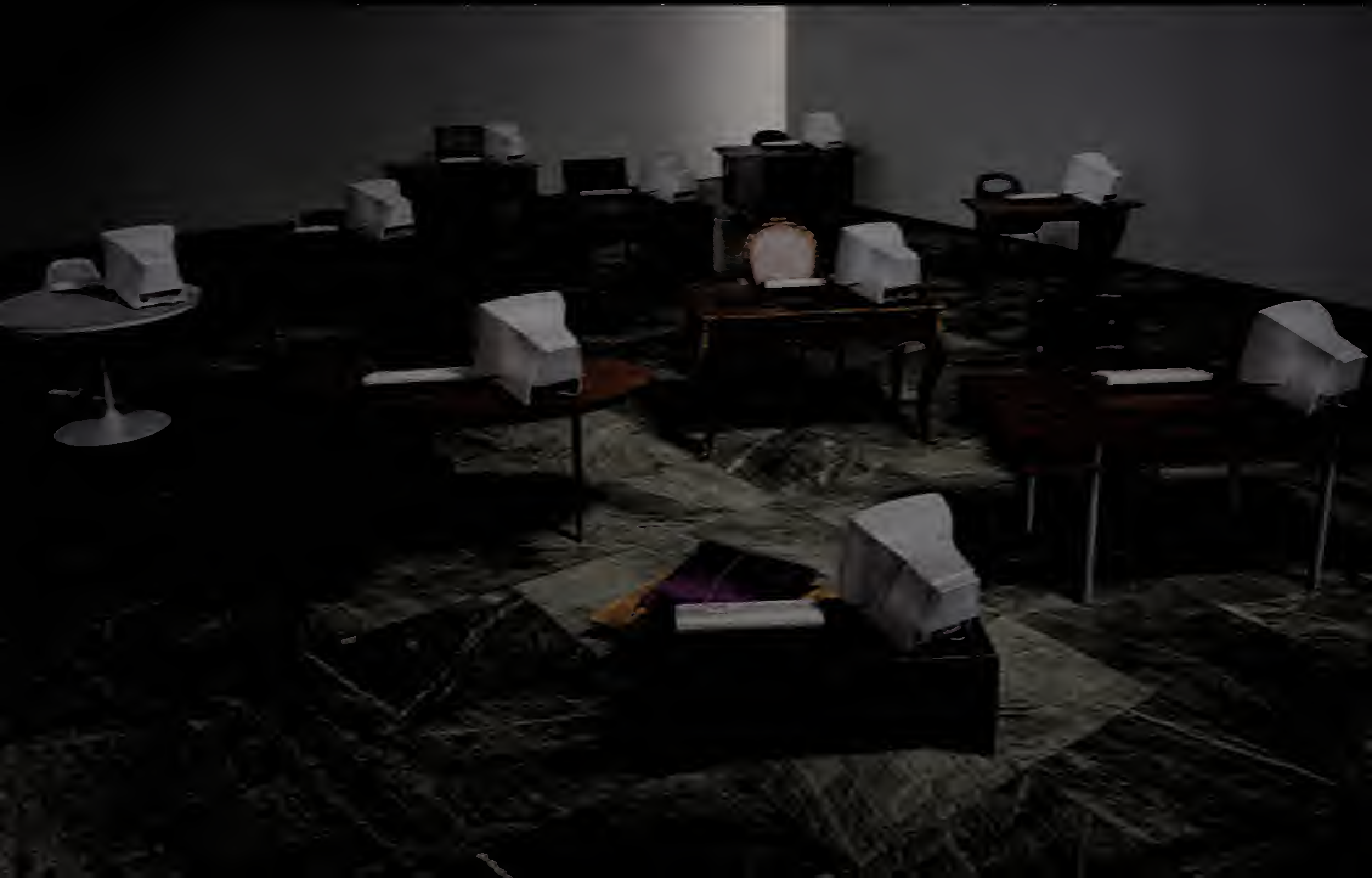

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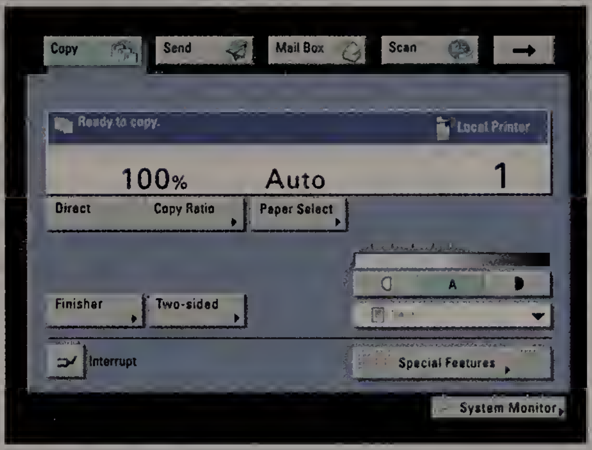

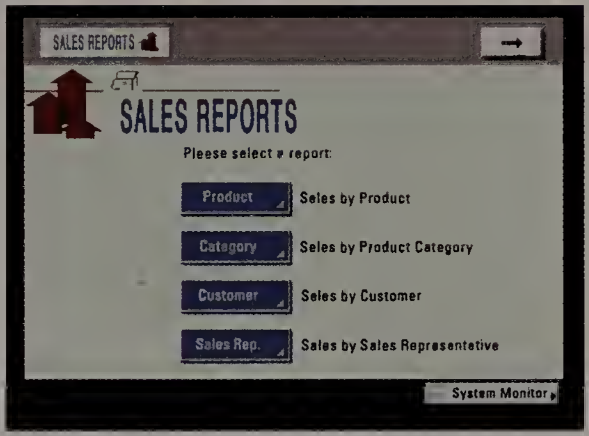

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Interactive features from December 15 to January 14

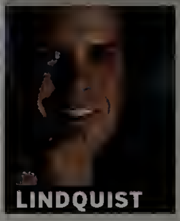
ADD A COMMENT

What Does the Future Hold?

- Should L-1 visas be restricted? (See **U.S. Stays on Top**, Page 44)
- What if operations for the whole IT infrastructure could be outsourced? (See **The Rise of the CIO**, Page 62)
- Might a digital Pearl Harbor result in applications that *cannot* be integrated? (See **After the Storm, Reform**, Page 70)
- Will Europe and Asia lead the way toward the adoption of open-source software? (See **A Land Where Giants Rule**, Page 54)

We've given you our "tipping points" and alternative futures. What's your take? Go to the **ADD A COMMENT** section at the end of each of these articles online to read your peers' predictions—and to prognosticate yourself.

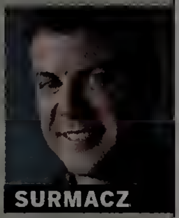
Our Daily Web



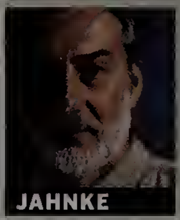
MONDAY Tech Tact
Technology Editor Christopher Lindquist covers what's coming.

TUESDAY Quick Poll
Vote with your mouse, and see how other IT leaders feel about current events.

WEDNESDAY Metrics
Web Writer Jon Surmacz makes sense of the numbers.



THURSDAY Sound Off
Web Editorial Director Art Jahnke opines on managerial, political and ethical dilemmas.



FRIDAY The Big Picture
Charts and graphs that are worth a thousand words.

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From the Editor

lundberg@cio.com

Write your own future with a comment on our predictions. Go to *www.cio.com*, click on the feature, and post your predictions in the ADD A COMMENT box found at the end of each story.

Is Your Future Written?

EVERY JANUARY, we produce a special issue of *CIO* magazine to kick off the new year. This is usually an upbeat if not celebratory look at business or technology, or some intersection of the two.

This year's issue is not so happy. Given the profound forces at work right now, we decided to charge our writers and editors with reporting on and analyzing today's trends in technology employment and innovation, security, the software industry and IT governance, and to spin those trends out to 2010. As we factored in various influences (what we refer to as "tipping points") on our scenarios, we began to see paths branching off here and there, leading in different directions to different futures.

But we didn't want to present a vague, equivocal view of where things are going; being ambiguous is a luxury no one can afford. So we've taken a stand, planting our flag in one likely outcome for each of the four areas we explored. These are presented in our feature articles as "Scenario One."

At the same time, we felt it was important to play out an alternate future for each. You'll find these labeled "Scenario Two."

We've included an interview with famed MIT economist Lester Thurow. At our CIO Perspectives conference in November, Thurow argued that globalization is inexorable, and that we're moving toward a harsher form of capitalism than we've seen in the past. This belief is reflected in some of our reporting in this issue. But Businesspeople can influence the course of events to create a better future—for themselves, for the U.S. economy and for the developing world as well, Thurow asserts in his interview with Art Jahnke on Page 78.

Working to shape that future requires CIOs and other executives to make choices that demand real moral courage in the face of powerful forces. Even then, it's almost impossible to see the impact of your actions on the world. So people ask themselves, What can one man or woman do?

I think the more relevant question is, What happens if each man or woman does nothing at all?

Do you think you can help shape the future? Drop me a note to let me know why or why not.

Abbie Lundberg

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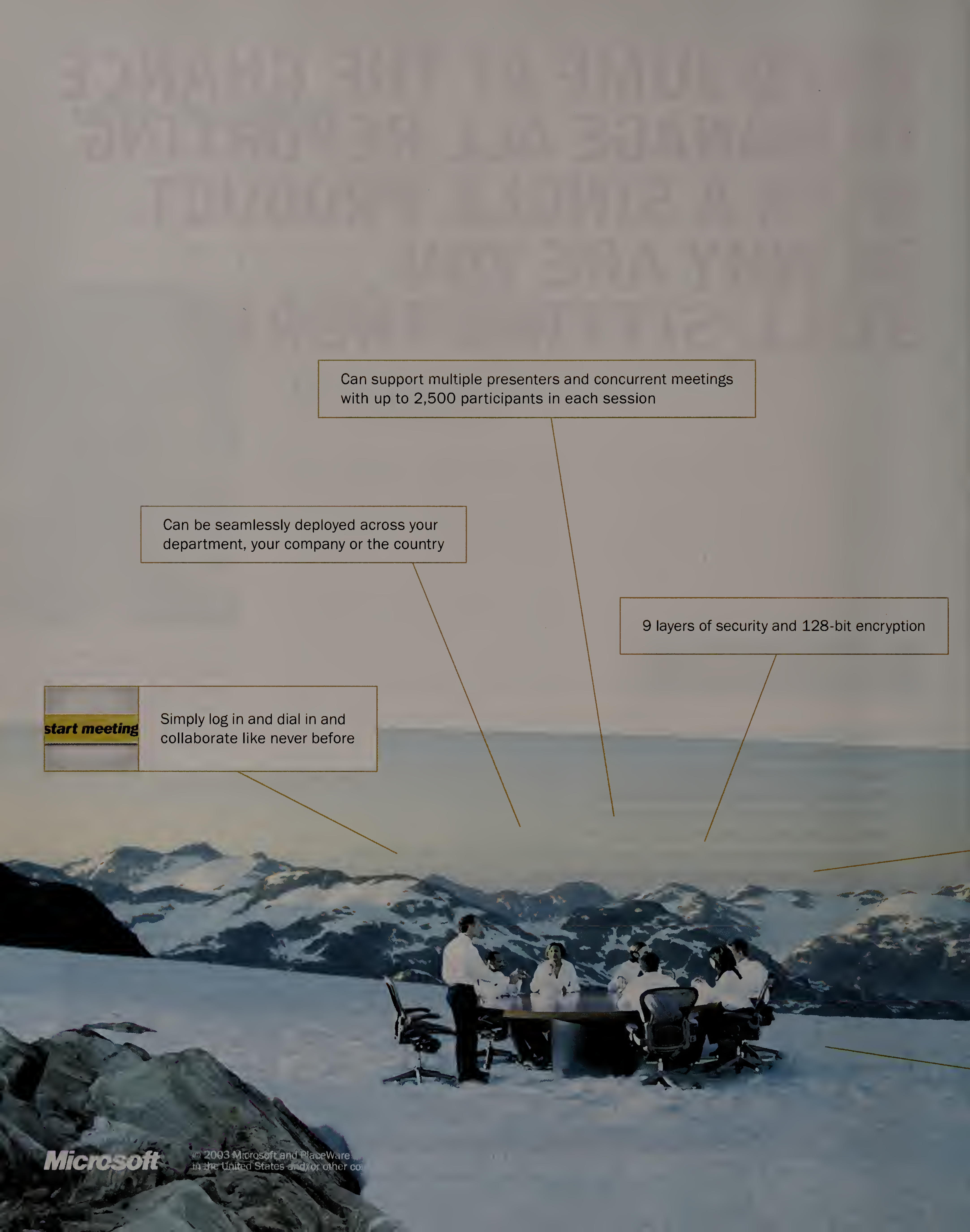
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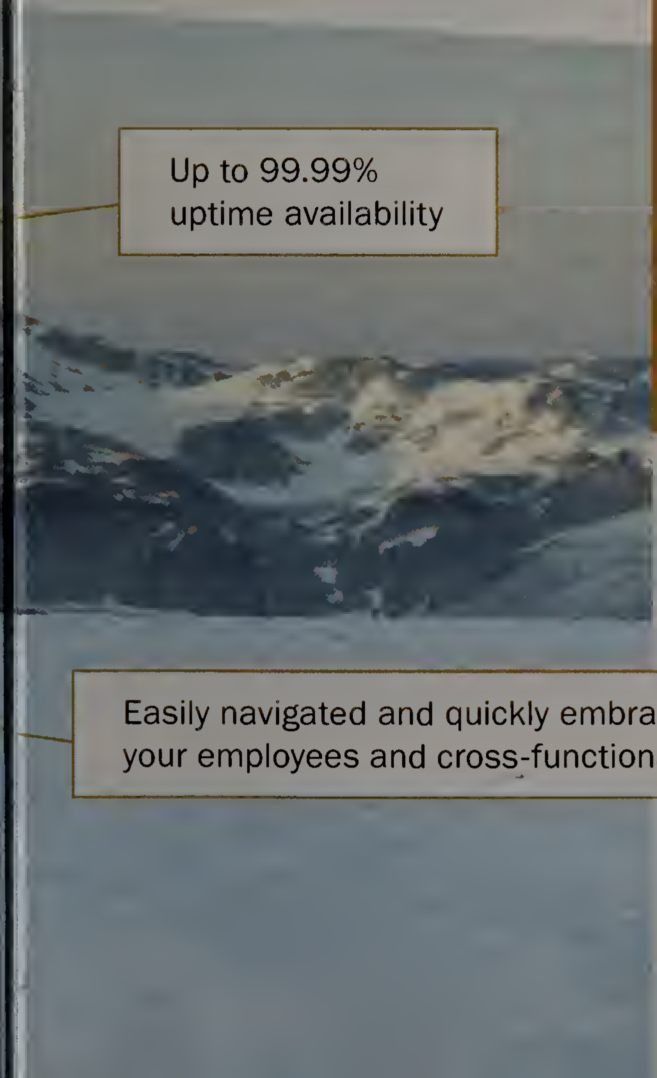
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How to Reach Us

E-mail *letters@cio.com*

Phone 508 872-0080

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Edited by Michael Goldberg

2010

SMART SYSTEMS

Evolution Inspires IT Development

ILLUSTRATION BY GEOFFREY GRAHN

EVOLUTION IS A HOT TOPIC in IT circles. There is, appropriately enough, evolutionary computation, which bases aspects of computing on biological systems that gradually change into "a different and usually more complex or better form." The process of evolution provides models for dealing with the complexity of advanced IT systems. You could think of studying the development of species over time—or building models that replicate natural selection—as a giant Google search for the species (or IT application) that thrives rather than falters.

"Evolution itself is a fantastic search engine—it goes through millions and millions and millions of things, and comes up with extremely creative designs," notes Eric Bonabeau, chairman and chief scientific officer at Icosystem, a company that does work in complex adaptive systems and counts DuPont, Humana, Intel and Schlumberger among its clients. Icosystem, for example, built a simulation that accounted for market conditions, employee scheduling and the rigors of humans working on oil and gas rigs for two straight weeks without much sleep to help a client determine the best way to manage its staff and equipment.

There are grander schemes to talk about, too. Future visions recently cited by academics such as W. Brian Arthur include a future where a smart traffic-signal system adapts instantaneously to minimize congestion and keep city motorists moving; or, in a poignant thought for millions affected by last summer's blackout, an updated electrical grid that responds nimbly to surges in power demand during a heat wave.

Bonabeau says that the extreme complexity of today's computing systems, and the often unseen connections between them, makes various aspects of our natural world potential models.

Two types of evolutionary approaches exist. One looks at evolution itself as the model, trying to map how things evolve. Hence "genetic algorithms," which have offspring and mutate into more effective algorithms over time. The other looks at the products of evolution—biological systems. This holds that one should look to see how nature solves certain problems, such as communication in a bee hive or school of dolphins. The phenomenon stems in part from

Continued on Page 22

> **The world of the future will be an evermore demanding struggle against the limitations of our intelligence, not a comfortable hammock in which we can lie down to be waited upon by our robot slaves.**
>
> –Norbert Wiener (1894-1964), *God and Golem Inc.*, 1964

"Next month's meeting is postponed.
All 30 members need to be notified."

"All Midwest Development Team Members:
Meeting confirmed for 9 a.m."

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Future Is Now at Supermarket

AT ONE OF Metro AG's Extra supermarket outlets in the industrial Ruhr Valley city of Rheinberg, Germany, about the only thing automated systems won't do is place a shopper's groceries in her car.

This is the retail giant's experiment begun in April known as the Future Store. Here, a shopper pushes a cart equipped with a mini-PC. The cart-mounted device lets a shopper scan the bar codes of items she selects and calculates a running tab. In the produce aisle, scales with digital cameras differentiate tomatoes from apples and provide price-label printouts. Kiosks offer advice on wine and meat selections. A wireless LAN guides shoppers through the store to the products they're seeking. And self-service checkouts make payments automatic.

Shoppers don't have to use this high-tech gear, but as of October, the Future Store initiative was delivering results that many retailers would die for: a 30 percent increase in the number of new customers and a rising share (up to 43 percent, from 30 percent) of regular patrons using the IT shopping tools. Shoppers gave the highest ratings (64 percent approval) to the store's "wine assistant" kiosk, while self-checkout came in second. Another finding, according to a study conducted by The Boston Consulting Group, was that users of the new technologies tend to be volume buyers, such as families.

"What we're seeing is that customers who use the new technologies like the Personal Shopping Assistant mini-computer typically have more time to shop and buy more," says Metro spokesman Albrecht von Truchsess. "They like being able not only to keep a running tab of their purchases but also to learn about specials and locate products."

Metro is mum on how much the company and its partners have invested in Future Store. During this testing stage, the company prefers to talk less about return on investment than it does "return on opportunity," says Future Store project manager Gerd Wolfram. Metro is collaborating with more than 40 partners, including Cisco, IBM, Oracle and SAP. "All of them participate in the costs—and the opportunities," says Wolfram. One thing's for certain: A lot of players in retail and IT will be sure to keep watch on the future of this store. *–John Blau*

Shoppers at Metro's pilot supermarket see a running tab of groceries they've selected on a computer display attached to their carts. A self-service scanner identifies produce and prints a label with weight and price.

Evolution

Continued from Page 20

Janine Benyus's 1997 book *Biomimicry: Innovation Inspired by Nature*, which showed how clever humans emulate nature to solve problems. For instance, there's jigsaw computing, which models itself after neurons and other cells, and may provide a basis for developments in nanoscale computation. Photosynthesis and protein microtubules provide potential models for optical network architectures.

IT has long looked to the natural world for certain models. Expert systems and artificial intelligence were built to replicate how we think, and neural networks use the brain as a model. Various systems security efforts have drawn on the human immune system, notably IBM's Digital Immune System for Cyberspace (currently licensed by Symantec) and Sana Security's Primary Response product. And—who hasn't heard of autonomic computers that will, among other things, heal themselves?

Perhaps it's just coincidence that so many aspects of nature become popular in IT. After all, it's only in the last few years that computing itself became second nature for most of us. *–Michael Fitzgerald*

E-COMMERCE

First-Mover Advantage

NOW IT'S OFFICIAL: Strong market positioning means price-setting power in online sales. That's the word from an April 2003 study on the effects that price changes had on the online book sales of rivals Amazon.com and Barnesandnoble.com.

The study's authors, economics professors Austan Goolsbee of the University of Chicago Graduate School of Business and Judith Chevalier of the Yale School of Management, collected data in 2001 using publicly available price and sales ranking data on both sites.

They found that Amazon.com's position of market dominance meant it could charge higher prices for books. A 1 percent price increase reduced sales by 0.5 percent at Amazon.com, but the same percentage price hike at bn.com cut sales by 4 percent, the study found.

"One can only think that if you lack any brand identity, that it's even worse. That if you raise your prices just a small amount, you lose a tremendous amount of business, and it suggests that a guy without a brand identity faces a pretty tough situation in the online environment," Goolsbee says. *–Juan Carlos Pérez*

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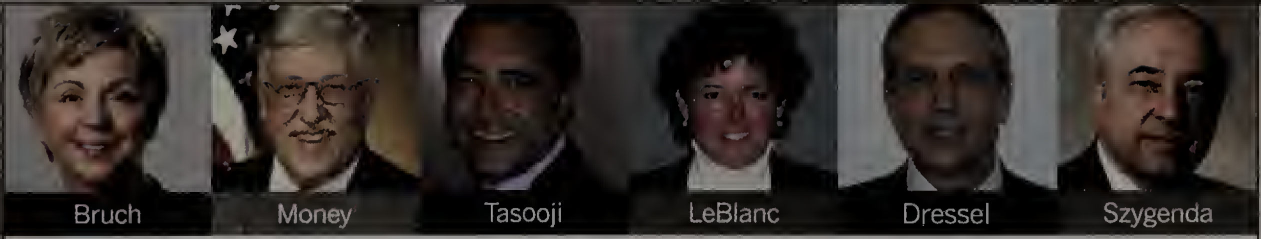

CIO CAREERS

Year Ends with a Flurry of Moves

MAYBE IT WAS THE SEASON, but 2003 drew to a close amid a flurry of CIO appointments and career moves. Here's a top-10 list from the storm of changes and appointments.

Michael B. Tasooji, 46, the former senior vice president and CIO at **Walt Disney**, was due at year's end to take on the position of executive vice president and CIO at clothing retailer **Gap**. Tasooji will report to CFO Byron Pollitt and serve on Gap's executive leadership team. He succeeds **Ken Harris**, who held the job since 1999.

Edward L. Glotzbach left his post as executive vice president and CIO of **SBC Communications** to become CFO of **TPI**, an IT and business process outsourcing advisory consultancy. Glotzbach, had served as president of SBC Services, and CFO and treasurer for Southwestern Bell Telephone.

United Air Lines's parent company, UAL Corp., promoted Vice President of IS **Nirup Krishnamurthy** to CIO. Krishnamurthy's 13-year tenure at the company includes a stint as managing director of application development and managerial roles in research and development, operations and aircraft maintenance.

German giant **Siemens AG**'s U.S. arm appointed **Jan D. Dressel**, 43, as vice president and CIO. He's now reporting to President and CEO Klaus Kleinfeld and oversees the company's IT and e-business strategies.

Matt Lynch took over as senior vice president and CIO at Midwest retailer **ShopKo Stores**. Lynch, 44, joined ShopKo in 1998 as vice president of operations and technology services. He succeeds **Paul Burrows**, who died unexpectedly in October.

Mary LeBlanc, former vice president for global commercial IT at **Pharmacia**, joined **Cendant Car Rental Group** as senior vice president and CIO. Cendant owns the Avis and Budget automobile rental brands.

Brokerage **A.G. Edwards** appointed **John Parker** to be CIO. Parker takes over for **Mary Atkin**, who was CIO for five years and has become corporate strategy director.

On Wall Street, **Gerard A. Callaghan** was named executive vice president and CIO at **U.S. Trust**. Previously, Callaghan had served in senior IT positions at Deutsche Bank and Citigroup.

Arthur Money, a former assistant secretary and CIO at the **Department of Defense**, joined the board of directors at **Intevac**, a maker of manufacturing equipment for the high-tech industry.

Internet service provider **EarthLink** named **Travelocity** founder and former **Sabre** CIO **Terrell Jones** to its board of directors. Jones is a digital economy consultant and partner in General Catalyst Partners, a venture capital company.

CIOs in the BOARDROOM

LOOKING BACK, 2003 was a year in which more CIOs found themselves reporting to the CFO (see "Whatever Happened to the CIO?" Page 64). But the year also saw more CIOs on corporate boards. Among notable appointments:

Denis J. O'Leary, former CIO of **J.P. Morgan Chase**, to the **Network Associates** board.

Ralph J. Szygenda, group vice president of information systems and services and CIO of **General Motors**, to the board of the Handleman Co., a music distributor.

Ruth E. Bruch, senior vice president and CIO of **Lucent Technologies**, to the **Mellon Financial** board of directors.

Harriet Edelman, senior vice president and CIO of **Avon Products**, to Hershey Foods' board of directors.

Bob L. Martin, CIO of **Wal-Mart** from 1983 to 1992, to the board of retailer **Dillard's**.

CIO'S BOOKSHELF

Best-Sellers for 2003

1 **The Tipping Point: How Little Things Can Make a Big Difference**
By Malcolm Gladwell
Little Brown and Co., 2000

2 **The Great Unraveling: Losing Our Way in the New Century**
By Paul Krugman
W.W. Norton, 2003

3 **Leadership on the Line: Staying Alive Through the Dangers of Leading**
By Ronald A. Heifetz and Marty Linsky
Harvard Business School Press, 2002

4 **Globalization and Its Discontents**
By Joseph E. Stiglitz
W.W. Norton, 2002

5 **Pigs at the Trough: How Corporate Greed and Political Corruption Are Undermining America**
By Arianna Huffington
Crown Publishing Group, 2003

6 **Good to Great: Why Some Companies Make the Leap...and Others Don't**
By Jim Collins
HarperBusiness, 2001

7 **The Lexus and the Olive Tree: Understanding Globalization**
By Thomas L. Friedman
Farrar, Straus and Giroux, 2000

8 **Leadership Presence: Dramatic Techniques to Reach Out, Motivate, and Inspire**
By Belle Linda Halpern and Kathy Lubar
Gotham Books, 2003

9 **Built to Last: Successful Habits of Visionary Companies**
By Jim Collins and Jerry I. Porras
HarperBusiness, 2002

10 **Execution: The Discipline of Getting Things Done**
By Larry Bossidy and Ram Charan
Crown Business, 2002

SOURCE: January 2003 through October 2003 data, compiled by WordsWorth Books, Cambridge, Mass.

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SIMULATIONS

A Visit to Europe's Mission Control

AT 19:15 GREENWICH MEAN TIME on June 2, 2003, after one Earth orbit, the space probe *Mars Express* separated from the final stage of the giant *Soyuz-Fregat* rocket launcher that had blasted off from the Baikonur Space Center in Kazakhstan. Europe's mission to Mars was under way.

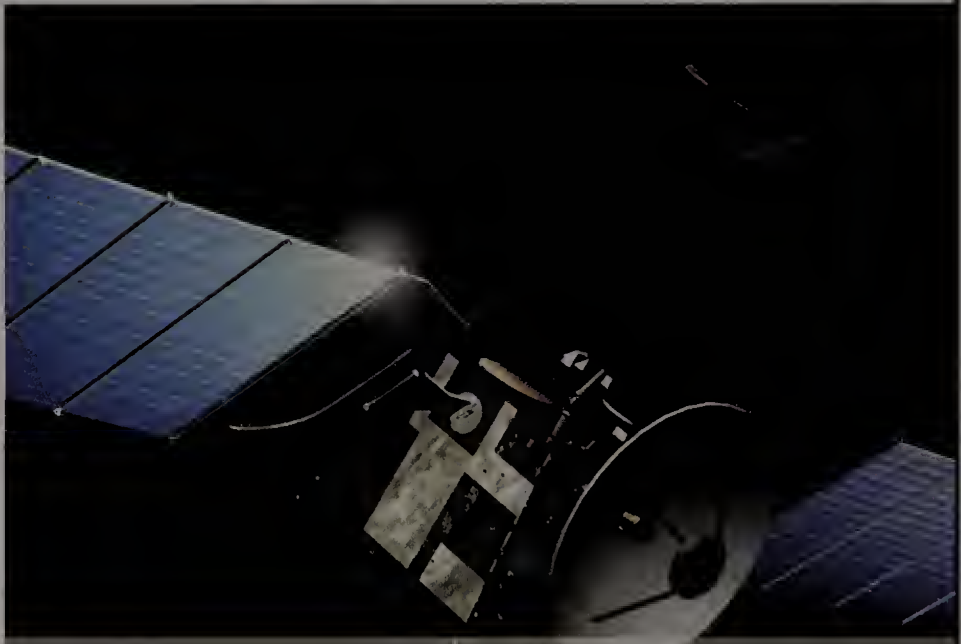
The launch was faultless, and the *Mars Express* orbiter, along with the *Beagle 2* lander, are due to reach Martian orbit on Dec. 25, 2003. Part of the credit goes to an obsessive focus on simulating what could go wrong, says simulations officer Zeina Mounzer. "As we get closer to launch, the simulations become increasingly unlikely but have a bigger impact on the mission's success," says Mounzer, who shows her colleagues the movie *Apollo 13*, in which NASA engineers work to save the crew of a disabled orbiter.

Mounzer and eight of the *Mars Express* mission engineers are employed by Vega Informations-Technologien, a Darmstadt, Germany-based company that has worked on various European space programs since 1978. Over time, Vega's simulation work has grown faster than its mission control work, says company director John Lewis.

Lewis says the agency's early simulations in the mid-1980s were crude, but today's take place in the very control room that will be used for the mission. Consoles send commands not to the real spacecraft but to a software simulation of it constructed by Vega, running the real mission software code. Routinely, he explains, the simulations detect software glitches that went undetected by the spacecraft's manufacturer.

Europe, Lewis adds, simulates missions to a much greater extent than does NASA. Indeed, an official NASA inquiry into the failure of the U.S.'s Mars Climate Orbiter mission, which burned in the Mars atmosphere in 1999, concluded that the mission's navigation team lacked training needed to detect an engineering mistake that delivered navigation data in English units rather than in metric units.

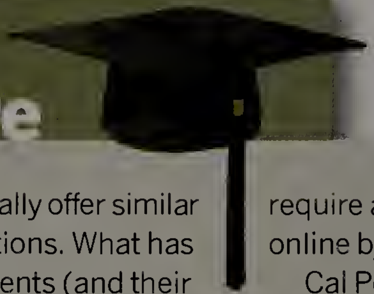
–Malcolm Wheatley



A computer-generated rendering of the *Beagle 2* lander leaving the *Mars Express* orbiter.

ONLINE APPLICATIONS

Portals to the Future



AS SOON AS Joseph Wiesenberg of Poway, Calif., knew that he wanted to attend California State Polytechnic University, he turned his browser to the school's website and applied online. There, the 18-year-old was able to transfer his high school transcripts, upload personal essays and learn more about his prospective computer science major. He even paid the $55 application fee (with his parent's credit card). Time elapsed: about one hour.

Online college applications, many of which are due Jan. 1 for the the next school year, are not new. Admissions experts say that more than 75 percent of colleges nationally offer similar online applications. What has changed: Students (and their parents) are now much more comfortable submitting their qualifications online, with almost 60 percent of students applying without paper of any kind. That's a sharp rise from two years ago, when the journal *eSchool News* cited a sub-30 percent rate at many schools.

Students tout the technology for its convenience, while academics and admissions officers hail it for streamlining a data-entry laden admissions process that historically cost millions. Some schools have announced that they will require all students to apply online by 2005.

Cal Poly is one of those schools. The online application for the Pomona, Calif.-based institution is the brainchild of programmers at Xap Corp. of Culver City, Calif., which hosts a similar feature for more than 700 schools nationally. Applicants visiting one of these sites enter their applications into pages hosted by the Xap server. Nightly, technologists at each school download the data through a webpage with secure sockets layer encryption, then upload applications directly into their administrative systems. In minutes, they do what formerly took data-entry workers months. And students can visit Xap.com or CollegeNET.com and apply to multiple schools at once.

Some schools have homegrown systems. At the University of California, Senior Online Communications Analyst Hosanna Stevens says she's spent the past year building Pathways, which enables admissions directors at 10 schools to download data directly into their systems.

"On both sides of the screen, students and admissions people are amazed at what we've been able to do," says Stevens.

–Matt Villano

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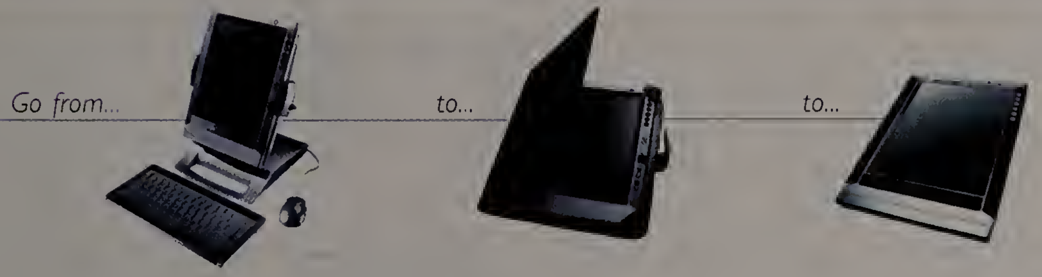

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Washington Watch

Edited by Elana Varon

A CIO's Agenda for 2004

CIOs critique Congress on a national plan for Internet sales taxes and raising H-1B visa limits

CONGRESS IN 2004 is set to address the problems of Internet sales taxes and whether to increase the number of visas for foreign high-tech workers. We asked CIOs and e-commerce executives to weigh in on the wisdom of the lawmakers' efforts.

ISSUE: Fair Internet taxes for all
2004 AGENDA: Create a national agreement for collection of state sales taxes from online and catalog retailers

▶ **The rub:** Currently, states can't force retailers with no in-state stores to collect sales taxes, and state and local government lost more than $13 billion in 2001 because of it, according to a study by the University of Tennessee. Pending legislation in Congress, sponsored by Rep. Ernest Istook Jr. (R-Okla.) and Sen. Michael Enzi (R-Wyo.), would allow states to require remote sellers to collect taxes by joining a national agreement. Companies with annual out-of-state sales of less than $5 million would be exempt.

> "It's fair for every retailer to pay the same taxes, whether or not they have a physical presence in a state."
>
> –SAM TAYLOR, VP OF E-COMMERCE, LANDS' END

▶ **E-commerce execs say:** It's fair. Every retailer should pay the same taxes, says **Sam Taylor**, vice president of e-commerce with Lands' End, whether or not they have a physical presence in a state. Before it was acquired by Sears in 2002, Lands' End collected sales taxes in only five states but now collects taxes on catalog and Internet sales in all 50. "The role of government is to level the playing field, creating rules and laws that balance fair trade with bureaucracy," says Mark Kohls, former director of e-commerce technology with furniture retailer KI Inc., which does not collect sales taxes in 27 states.

ISSUE: Who gets tech jobs
2004 AGENDA: Raise the limit on the number of foreign high-tech workers allowed in the United States on H-1B visas

▶ **The rub:** On Oct. 1, the cap on H-1B visas dropped from 195,000 to 65,000. With bills pending that would further limit H-1Bs, lawmakers are being pressured on one side from companies such as Intel, which says it continues to have trouble hiring U.S. workers for some high-skill tech jobs, and on the other by workers who point out that unemployment for some technology jobs is at an all-time high.

▶ **CIOs say:** Depends who you ask, even among tech company CIOs who, as a group, clamor for foreign labor. "There are plenty of people in the United States willing to perform these jobs," says Walt Crosby, executive vice president and CIO at Terabase, a search engine and database software vendor. Crosby thinks his peers are misusing the visas by importing foreign workers as cheap labor, instead of hiring foreign workers only for hard-to-fill positions.

–Grant Gross

Antispam Bill Won't End Junk E-Mail

CIOs skeptical of congressional compromise

AN ANTISPAM BILL that was poised to become law at press time may do little to stem the barrage of junk e-mail, according to CIOs.

The legislation, called the Can-Spam (Controlling the Assault of Non-Solicited Pornography and Marketing) Act, would require senders of unsolicited commercial e-mail to let recipients opt out of future mailings, set penalties for sending deceptive messages and create a national Do Not Spam list. The measure requires all e-mail advertising—not just unsolicited messages—to include a valid reply-to address, a valid postal address and accurate headers and subject lines.

But CIOs say it won't work, since so much spam comes from outside the United States. Tod Ferran, CIO of Riverton Motor Co., an auto dealership based in Sandy, Utah, says you'd need "the authority of a world government" to enforce such a law. Instead, he favors a technological solution (the open-source Mozilla e-mail system he uses includes a junk mail filtering feature) as well as "education of the public" to not respond to spam solicitations.

Matt Kesner, CTO of the Fenwick & West law firm based in Mountain View, Calif., thinks legislating against spam is worth a try, but he questions why the Senate would pass a bill that would trump a strong new California antispam law requiring marketers to get permission from or have an existing business relationship with a recipient before sending mail. Without better technological and legal solutions he's afraid "we'll get to the point where we accept e-mail only from people we know." –G.G.

Matt Kesner, CTO, Fenwick & West

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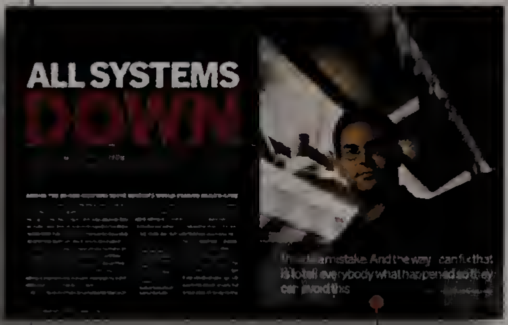
THE YEAR IN REVIEW

2003: The Big Issues

COST-CUTTING, thankfully, didn't dominate the language of IT this year the way it did in 2002. A review of *CIO*'s 2003 coverage shows that CIOs were, instead, locked in a struggle for control. Control of spending, yes, but more important, control over the levers of IT investment. CIOs were trying to get a grip on new government regulations; they were studying ways to improve network reliability and systems security. It also was a time for CIOs to brush up on techniques for finding and keeping good people—whether here or abroad. And to solidify their position in the executive suite. A look back at the big stories:



February 15

NETWORK FAILURE: ALL SYSTEMS DOWN

It takes constant vigilance—and the replacement of creaky network gear—to maintain a modern IT infrastructure. That's the lesson Boston's Beth Israel Deaconess Medical Center learned the hard way when a network outage forced the facility to divert emergencies to other hospitals for two days and required doctors to revert to paper patient records. Fixing the problems took a total rethink of network architecture, disaster plans and IT staff assignments. Later in 2003, Beth Israel's CIO claimed that these efforts protected his systems against a summer onslaught of Internet-borne worm attacks.

April 15

WHAT TO DO WHEN UNCLE SAM WANTS YOUR DATA

In recent years the federal government has responded to major crises with new laws that place a heavy emphasis on IT systems and data access. The Patriot Act, a response to the 9/11 terrorist attacks, allows the FBI to ask retailers and other businesses for customer records—requests that violate many companies' privacy policies. Caught between their customers and the government, CIOs in 2003 needed to revise privacy policies and seek legal advice. Good relations with lawyers was a theme that carried through the year, as other government rules—applying to issues such as corporate governance and medical records privacy—hit the top of CIO agendas.

May 1

PORTFOLIO MANAGEMENT, HOW TO DO IT RIGHT

Though CIOs are no strangers to fiscal management, 2003 saw a renewed interest in such disciplines as project portfolio management, a process for prioritizing projects that align with business goals. (In 2003, *CIO* also ran stories focusing on the Balanced Scorecard and Six Sigma.) Why this emphasis now? More than ever, CEOs are demanding that IT investments return immediate dollars to the top and bottom lines.

June 1

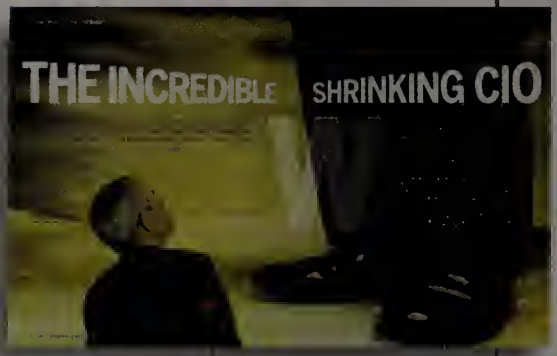
INSIDE OUTSOURCING IN INDIA

CIOs at United Technologies were sending work to Bangalore long before Indian call centers and programming shops hit the American media's radar. These outsourcing veterans learned that you need to control the work (choosing the right jobs for overseas technologists) and the relationships (managing expectations and performance) before you can reap the strategic and cost-cutting benefits of offshore outsourcing.

September 1

THE ULTIMATE COST OF OFFSHORE OUTSOURCING

With the nation experiencing what some analysts called a jobless recovery, CIOs' cost-benefit calculations about whether to outsource IT work to Asia or Eastern Europe came with an unwanted political question: What will the public think of companies that export jobs overseas? In addition, the total cost of an overseas project turns out not to be reflected by the figures in the contract; along with severance pay for laid-off workers, an offshore vendor's inexperience can add millions to the ultimate price tag. The key for CIOs: Keep your eyes open and your wits about you.



October 15

THE INCREDIBLE SHRINKING CIO

As the recession dust settled, CIOs saw their compensation decline in 2003. Tight budgets revealed that many executives still see IT as a cost center. And in 2003, the percentage of CIOs reporting to CFOs doubled from last year. Some CIOs reacted by taking other jobs, and others responded by deciding to run IT like any business unit, which included building relationships with other executives and providing more business training for staff.

That last point—the need for CIOs to invest in the care and feeding of their IT staffs—was another theme in 2003, a year in which the need to sustain productivity with either flat or reduced resources meant that staffers were pushed to the breaking point.

Sounds like a holiday break is in order. Now get ready for 2004.

For the Whole Story

To view the stories mentioned here, go online to **www.cio.com/printlinks**.

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Curtis Robb, CIO
Delta Air Lines, Inc.

access

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IT Leadership in 2010

The skills that CIOs will need to win the game

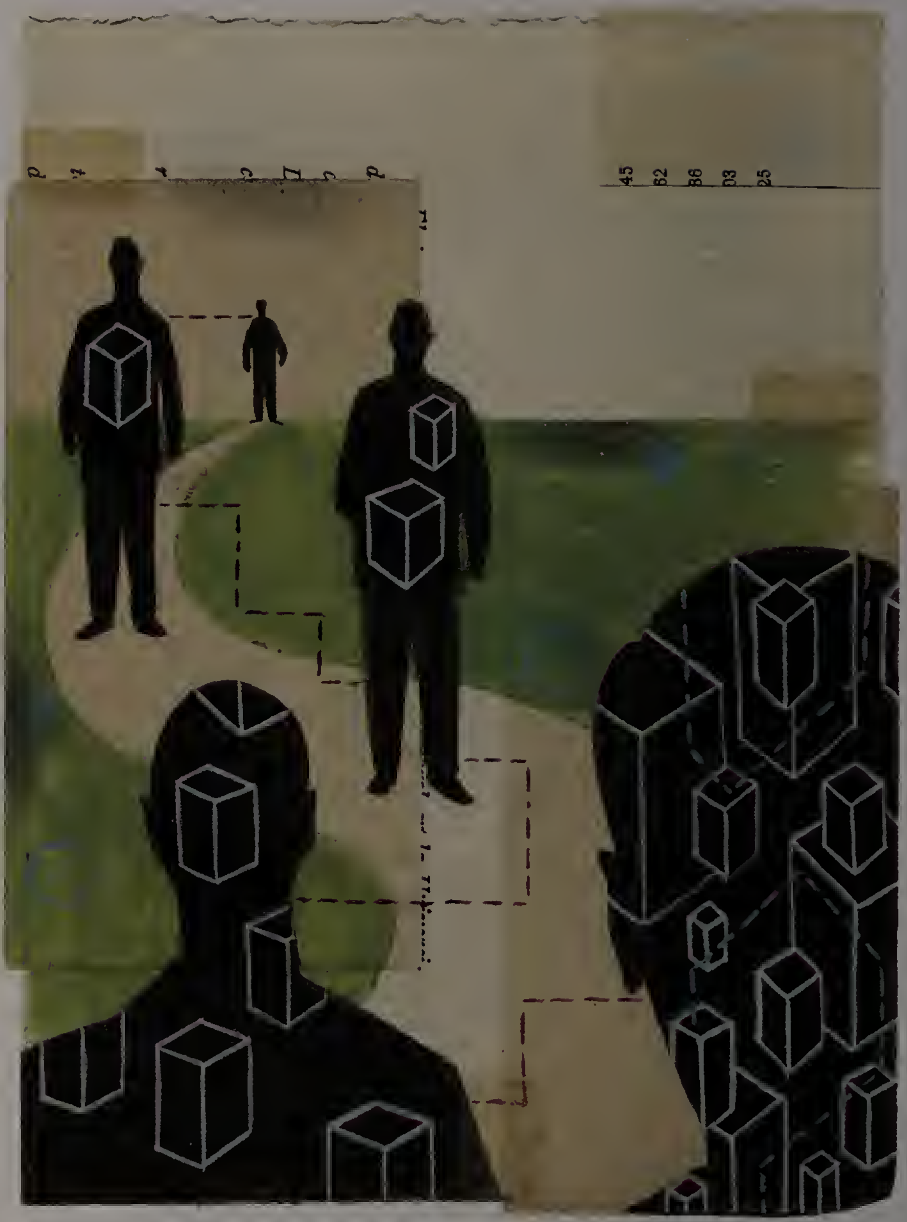
ILLUSTRATION BY LEIGH WELLS

OVER THE CENTURIES, technological innovation has spawned changes in how and where people live, play, work and provide for their families. The late Harvard Business School professor Jai Jaikumar described how fire, the wheel, the lathe, the steamboat, the locomotive, the automobile, the telephone and the airplane were transformational inventions. But his research shows that societies generally took 30 to 40 years to understand the possibilities of these inventions and leverage their use. When Jaikumar spoke to my IT group at Frito-Lay in the early '80s, he described the invention of the computer as similar to other transformational technologies. He predicted that the computer would go through a birthing period, a childhood and an adolescence before eventually reaching maturity. He estimated that this cycle would take a full human generation. I believe Jaikumar's historical perspective was correct; the computer age is now leaving its adolescence and will enter adulthood during this decade.

Jaikumar's research on technological innovation yielded another important observation: People, companies and even national economies have risen and fallen on their ability to understand and master "game-changing" technologies. Manufacturers that didn't embrace the lathe or the assembly line, for example, perished. Countries that were slow to adopt the steamboat or railroad fell behind in commerce.

If this pattern holds for the information age, then the responsibilities of the CIO in the modern corporation are staggering. It's a very tall order to be able to recognize the game-changing nature of IT, to have the street smarts and influencing skills to navigate executive committees to the right decisions, and to then have the technical savvy and skill in execution to deliver the goods. Most IT professionals have some of these leadership skills. Acquiring and employing these skills will be essential to IT leaders in 2010.

By then, most corporations that think IT doesn't matter won't be around. The leadership skills that CIOs will need for the rest of this decade fall into three major categories: understanding the lay of the land, building a great team and having an impact. I've organized the leadership skills into a frame-

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work that I believe can help many good leaders become great leaders. (In my next few Total Leadership columns, I'll talk about these competencies in greater depth.)

Getting the Lay of the Land

The first skill that will be required for great IT leadership is pattern recognition. In essence, this is the ability to see underlying relationships and get at "the meaning beneath the surface." CIOs with this skill can distinguish the important factors in a situation from "noise," demonstrate this insight to their colleagues through discussions and decisions, and craft a compelling story of the organization's challenges and opportunities.

Another important skill for IT leadership will be street smarts. CIOs need to learn who the important players are in their organizations and industries and know what issues matter to them. CIOs must know their organizations' full history and all the baggage that has built up over time. They have to be politically adept, leveraging their relationships with people to address problems and opportunities.

CIOs need to learn who the important players are in their organizations and know what issues matter to them. CIOs must know their organizations' history.

Technical knowledge is often dismissed these days as something CIOs can delegate. Nonetheless, IT leaders in 2010 will need to be technically savvy—able to sort complex issues independently and take advantage of technological opportunities while avoiding fads. Other corporate officers should view the CIO as a thought leader. One good way to accomplish this is by staying abreast of important technologies and trends.

Building a Foundation

The first leadership skill in this category isn't really a skill—it's a quality. CIOs must show personal character. This means doing and saying what's right, not just what is expedient or what others want to hear—even if it's at substantial personal risk. Without the credibility that comes from demonstrating character, you can't build a great IT team. In 2010, as today, CIOs will need committed staffers and partners to be successful. This will require mastery both of "hard" management skills (such as establishing clear performance expectations and dealing firmly with poor performers) and "soft" skills (such as mentoring and celebrating team successes). CIOs must foster passion among their staffs and suppliers and build a sense of enthusiasm for the work at hand.

In the next few years, the importance of influence and persuasion skills for CIOs will only grow. Leading other executives to a full understanding of the game-changing nature of IT will require a planned approach to influencing. Involve other execs in IT decisions to get their buy-in, and customize your approach for each person. There are limits to your personal influence; only by persuading others to support your course can you move the organization in the right direction in its use of technology.

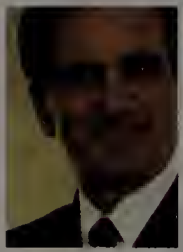
Creating Impact

Once you've gained an understanding of where IT needs to go and have built your IT team, you're ready to make waves. CIOs in 2010 will need to be high-profile in their organizations. They must set a course for others to follow toward strategically important goals. They must act with bold decisiveness—when there's a difficult decision to be made, don't hesitate. You know you've become an impact player when you can accomplish tasks without having to always lean on your formal authority. The credibility you've built gives weight to your opinions.

A lot of lip service is paid today to the notion that CIOs should act as business partners. By the end of this decade, however, it will become vitally important that IT leaders fully engage with their colleagues in the business—not simply to get their buy-in on IT projects, but to provide input that business leaders actively seek out. CIOs will need to articulate unstated business needs and guide the organization to better processes and solutions, tactfully challenging their colleagues' positions, when necessary.

Finally, CIOs in 2010 will need to be resilient. When there are problems—as there always are—IT leaders will need to emphasize solutions rather than hurdles. When IT is changing the game, you're the one who needs to develop new approaches to work over, around and through obstacles and setbacks.

I believe that by 2010, every CIO of a major, prospering corporation will possess all of these leadership skills, by definition—because organizations without great IT leadership will be also-rans. For today's CIOs, the requirement for the future is clear: Build on your strengths and work hard on your weaknesses. We each need to be personally accountable for improving our leadership skills if we are to become true change agents.



Charlie Feld is the former CIO for Frito-Lay, Delta Air Lines, Burlington Northern Santa Fe Railway and First Data Resources. He is CEO of the Feld Group, a CIO consultancy based in Irving, Texas. He can be reached at *charlie.feld@feldgroup.com*.

Open standards and the taming of the screw.

Can you see it?

IBM

Tony Menezes, IBM facilitator of open practices, financial industry

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ILLUSTRATION BY ALEX NABAUM

A Memo from the Future

Six years from now, CIOs may have their heads handed to them—unless they play their cards right

Date: December 15, 2009
TO: Executive Committee
FROM: General Manager at a Fortune 500 Packaged Consumer Goods Company
RE: The IT Business Performance Audit

This past year has been a nightmare. We've been experiencing the backlash of bad decisions our IT "leadership" has made—or should I say, not made—during the past five years. While the technologies may have greater capabilities, our IT management does not. Shame on the Executive Committee—and the Board—for not confronting IT earlier. Shame on me for not complaining earlier and more often. So much for the "alignment" promised by our CIO. He should be replaced. Now.

I do have some praise for IT before burying it. The Bangalore help desk seems fluent in English—finally. At least, I don't hear complaints about it anymore. But IT's pending proposal to shift the help desk to Chinese tele-centers in the Guangdong province to cut support costs and save an additional 15 percent strikes my management team as ill-advised. I think IT is chasing false economies in the name of making its numbers look better.

What does productivity mean when support requests that should never take more than two e-mails inevitably take five because of language problems? Or a straightforward upgrade that should take five minutes on the phone ends up taking 20? Do the math. IT's "productivity" comes directly at our expense. That's unacceptable. Attachment A is an audio file of real support calls with comparable Chinese help desks obtained from a colleague in another firm. I'm prepared to post it on our intranet if you tell me we have to go to China.

In fairness, however, I acknowledge that the remote diagnostics infrastructures IT has built into our mobile, laptop, desktop and server assets have made an enormous difference in both uptime and maintenance. Running those remotes overnight and getting people to call in or e-mail application

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settings to the help desk URLs for next day service has yielded phenomenal benefits at (apparently) very little cost. I'm prepared to give credit where credit is due.

It's too bad the best help desk interactions we have don't involve human contact, but we're still impressed. If we can effectively replace Chinese and Indian help desks with artificial-intelligence-based or neural net expert systems support, let's do as much as we can. Open Attachment B to see three XML-based prototypes of autonomous software initiatives our group wants to see from IT. Let's build on success.

I am similarly pleased by the business Wizards that empower our departmental, account and supply chain managers to make real-time modifications in process/workflow execution without any IT intervention. Our ability to improvise and customize process innovations on the fly has made people both feel better and work better. They feel less like data slaves to the ERP.

> **"We think our IT leadership is less interested in being a partner than a low-cost supplier of IT services. Unacceptable."**

That said, why do I think that IT set up these Wizards to get us out of their hair? They are nifty tools. But IT kicks us over to the Wizards rather than collaborate with us whenever we come out with innovative ideas for IT-based differentiation. IT's definition of collaboration and business alignment seems to be giving us new Wizards when we have new ideas. I confess we like the Wizards, but the approach seems very tactical. IT's strategy appears to be focused on having us do ever more work on our own rather than in partnership. This is a feature of our relationship that has the potential to be a bug. It's a sign of the CIO's constant "accountability avoidance." I'm sick of it.

A Big Winner

Without question, though, IT's mandating public-key encryption for all internal and supply chain communications has been a big winner. Everybody feels more confident about the security of their messaging and—of course—the added benefit has been our ability to screen out all manner of spam and viruses that aren't appropriately keyed. The initial resistance we saw from vendors and suppliers two years ago has vanished. More open exchanges of proprietary information have resulted. Ironically, the rise of traceable encryption has led to greater levels of trust and respect than anyone had anticipated. Good for us.

Better yet, our decision to require "personal" communications to be sent in nonencrypted clear text has cut down on systems abuses while preserving employees' needs to coordinate their private and professional lives.

Let's now talk about what doesn't impress: We all acknowledge that IT's global outsourcing of development over the past six years has proven to be a financial and business debacle. We got suckered by flawed accounting models that didn't incorporate hard dollar and time value-of-money costs for functionality upgrades. When Indian and Chinese developers cost 10 cents on the dollar for slightly lower productivity and quality, we could live with inefficiencies and slips. After all, we had saved a bundle by getting rid of our own older and disproportionately expensive developers. Getting 80 percent of the value for 20 percent of the cost was a good deal. I accept that.

But IT invested in Third World software development as if the 80/20 value proposition would exist in perpetuity. It obviously hasn't. To the contrary, IT seems addicted to believing it can always get good enough developers for 25 cents on the dollar. I'm here to tell you they can't and don't. (See Attachment C—our spreadsheet/Monte Carlo simulation of "cheap" programmer development on our cash flow.)

For our division, that 80/20 proposition has degenerated into 60/40, and I'll bet that holds true for more than half the divisions in this company. While that still looks like a bargain, it's not. Do the math. Except for commodity systems changes, any value-added software development initiative must now undergo an elaborate requirements analysis before being shipped overseas. We lack the in-house capability to do major application upgrades. We typically find that what should be accomplished in a quarter takes at least nine months. This in a marketplace that's demanding faster response times. Maybe that's why we're so Wizard-driven.

IT has at least three major in-sourcing initiatives under way, and I can describe them only as chaotic. Our involvement in the supply chain in-sourcing initiative only underscores that our IT leadership thinks Hindi or Cantonese is the most important software language. We don't agree. We think our IT leadership is less interested in being a partner than a low-cost supplier of IT services. Unacceptable.

What I have to say about IT's botching of our real-time CRM/SCM integration implementation I don't want circulated. So let's set up a time when we can videocon.

In the meantime, Happy Holidays! I look forward to the New Year.

Michael Schrage is codirector of the MIT Media Lab's eMarkets Initiative. He can be reached at *schrage@media.mit.edu*.

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FAST FORWARD
2010
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Smart CIOs are LOOKING AHEAD to the new year. Smarter CIOs are looking FURTHER.

In this special issue of *CIO*, we fast-forward to 2010 to explore what's in store for the IT workforce, the spirit of innovation, the software industry and, of course, security. Based on interviews with leading CIOs and industry experts, we report on several possible futures, or scenarios. How will you know which ones will prevail? Watch out for the tipping points. They'll tell the story.

If, for instance, IBM or another giant vendor relocates its base of IT operations to Bangalore, that could be a tipping point—a signal that the U.S. is on its way to becoming an IT backwater. But if Congress restricts L-1 visas, hampering the ability of companies to send work overseas, that could slow the pace of offshore outsourcing and keep the U.S. on the IT cutting edge. With both scenarios, there are tipping points that could take us in two very different directions.

Similarly, by 2010, CIOs could be even further in thrall to a few gargantuan vendors that keep prices high and technology impenetrable. On the other hand, open source could prevail—but only if CIOs go on strike against fast-consolidating vendors now.

Sadly, it will probably take more than user pressure to force a revolution in software design. We predict that it will take a digital Pearl Harbor. Such a disaster could lead either to a revolution in the way software is designed or to a security clampdown, with Big Brother monitoring and access to information and the Internet severely constrained.

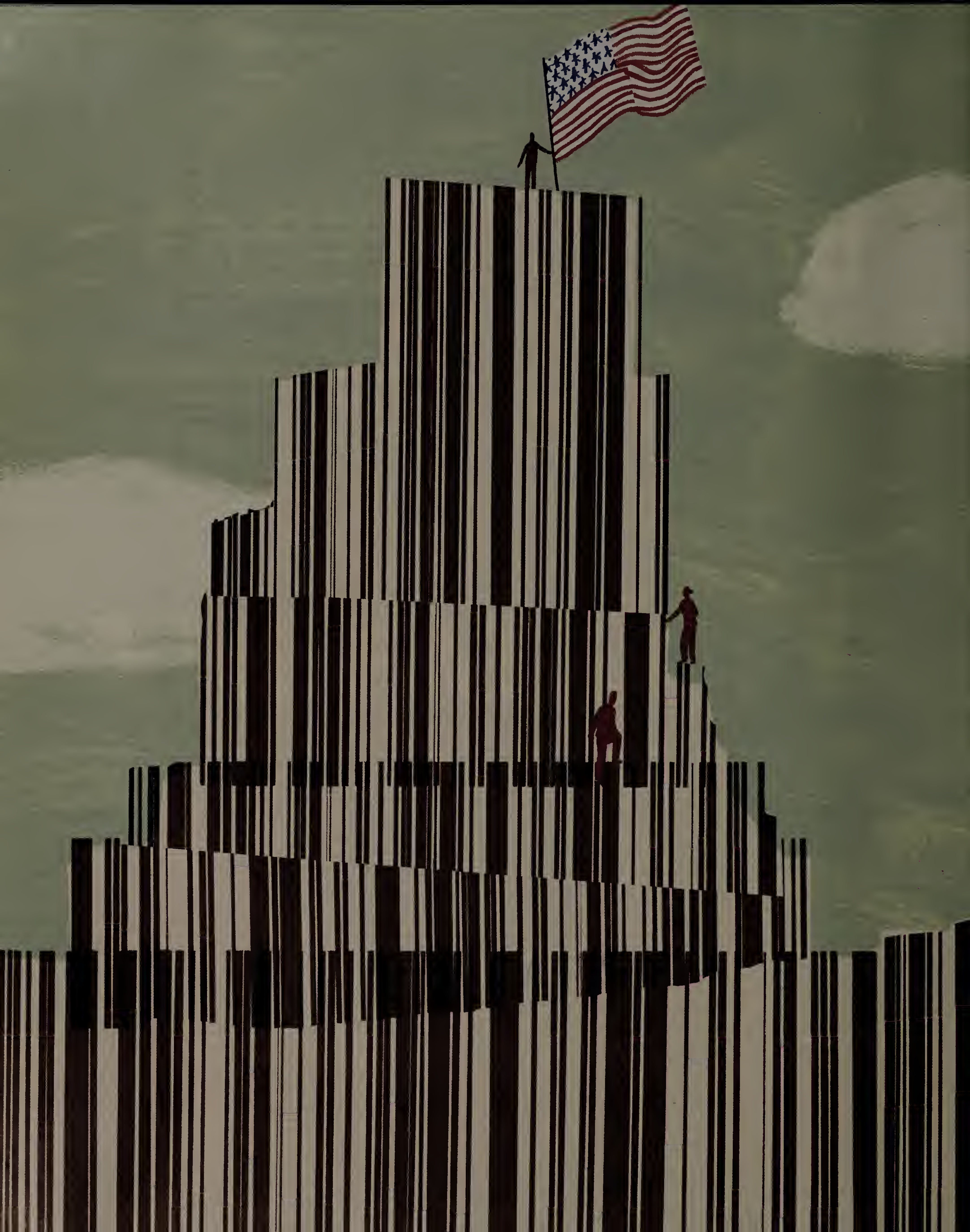
Finally, we explore what all this means for the future of the CIO. In one future, CIOs, as masters of the ultimate strategic resource—information—become more powerful than ever. But should CIOs fail to sell themselves as business innovators and instead become viewed as mere technology managers, they could fade from corporate memory. In a memo penned from the future, columnist Michael Schrage argues that CIOs who wish to retain their title come 2010 should take a much longer view than many do now on IT outsourcing, business alignment and the need for innovation.

Famed MIT economist Lester Thurow wraps up this special issue with an exclusive interview, telling us what we can do to shape globalization and protect American jobs.

The future, after all, is not written. What you do today will determine its shape tomorrow.

BY ALISON BASS

PHOTO BY PHOTODISC



[scenario ONE]

U.S. STAYS ON TOP

Even though some IT jobs will continue to move overseas by 2010, the United States will still have a sizable population of IT professionals doing high-level work on strategy, implementation and design

By the year 2010, Intel CIO Doug Busch envisions himself managing an IT staff that's all over the map, literally. Not only will his employees be working in places ranging from Rio Rancho, N.M., to Parsippany, N.J., in the United States, they'll also reside in Beijing, Leixlip, Haifa, Penang and a host of other locations Busch has never even been to. Each spot will specialize in a particular area of expertise for the company's IT department—call centers in Manila, business analysis at company headquarters in Santa Clara, application development in Mumbai. And a full roster of career opportunities—from entry level to senior leadership—will exist at each and every location.

"Talent will rise to the top, wherever it is," Busch predicts.

Busch's scenario may sound a bit like corporate IT's version of "It's a Small World." But the CIO of the world's leading computer chip maker already oversees IT workers in 27 countries around the globe. And most CIOs (to differing degrees) are headed in that direction.

The part of the picture that strays furthest from Disneyland is what this means for American IT staff. Even without offshore outsourcing, U.S. IT staffing levels were never going to return to their prerecession highs. The automation of tasks, increased productivity and

BY STEPHANIE OVERBY ■ ILLUSTRATION BY AUDE VAN RYN a reluctance to return to the unfettered IT budgets of yore pretty much guarantee that the demand for American IT professionals is destined to decline. But, incendiary conjectures to the contrary, the entire population of IT workers in this country will not be replaced by counterparts in emerging economies.

Instead, even as 2010 will see a further movement of some IT activities—application development, legacy maintenance, call center operations—overseas (Forrester Research estimates that the cumulative number of IT jobs heading abroad will grow from 27,171 in 2000 to 472,632 in 2015), U.S.-based companies will keep work here that requires close contact with the business: strategy development, business process improvement and the actual application of IT to the business.

The net result: There will still be a future in IT for smart young Americans. But the higher-level IT positions that remain stateside will require new skills. Today's CIOs would be wise to encourage broader business education in U.S. IT degree programs. And increased government and corporate support of IT R&D will be critical to retaining America's position as the world's IT leader.

"In the best-case scenario, IT will become a core competency and economic engine in emerging economies, and these emerging economies will complement the U.S. IT industry," Busch says. "A strong investment in education in the U.S. and intelligent U.S. government policies will produce aggressive investment and innovation, and the U.S. will benefit along with the rest of the world from the economic benefits of IT." (For a different future, see "Americans Need Not Apply" on Page 48.)

What Jobs Will Go

When it comes to the future of American IT staff, past is prologue. The current trend toward sending some IT work offshore actually began a decade ago, when stateside outsourcing began to gain favor. Companies such as Xerox inked multimillion dollar deals sending their IT work out the door to outsourcers. Some believed that the rise of the EDSs and CSCs would mean the fall of the in-house IT staff. That didn't happen, but today, with offshore outsourcing, IT workers are not simply shifting employers but in many cases losing their jobs altogether. And at many levels—lower-end programming, call center tasks, system maintenance and help desk work—that trend will continue.

"Commoditized work will go overseas," says Peter Cappelli, director of the Center for Human Resources at The Wharton School of the University of Pennsylvania. "Some more creative work—like noncommodity one-off and unique projects—will go overseas. But where interface with the business is important, that work will remain here."

Doug Busch, CIO of Intel, suggests that U.S. IT executives look beyond the possible short-term savings from offshore outsourcing to the long-term impact on the nation's ability to remain innovative.

PHOTO BY ANGELA WYANT

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It's hard to argue for keeping certain IT work stateside. The salary for a programmer with two to three years of experience averages $7,500 in India, according to NeoIT, an offshore consultancy. In Russia, it's $10,000. In the United States, it's $65,000. India graduates 75,000 computer scientists each year. The United States, 52,900. China, which currently brings 50,000 new IT workers into the world every year, could eventually provide 200,000 computer science graduates annually, according to Marty McCaffrey, executive director of Software Outsourcing Research.

Bandwidth costs have declined dramatically and should continue to dip, furthering the beneficial cost structure of transoceanic work.

"What will continue to go overseas are the repetitive activities, the things that will ultimately be automated anyway," says Nancy Markle, president of the Society for Information Management (SIM) and former Arthur Andersen CIO. "We have to be able to continue to get the best prices, or else we'll be growing companies offshore instead of competing with the rest of the world."

TIPPING POINT: In 2007, Congress passes restrictions on L-1 visas, hampering the ability of foreign outsourcers to bring their employees here to aid the transition of sending work overseas. The restriction on L-1 visas, which allow a foreign worker with specialized knowledge of a company's processes to work in America, slows the pace of offshore outsourcing.

What Jobs Will Stay

By 2008, the IT workforce situated in the United States will be 25 percent smaller than it is today, according to Gartner. But the workers who remain will be more important to the business than ever. They'll be working on architecture, strategy, project management and business processes, predicts Lance Travis, vice president of outsourcing strategics for AMR Research.

"A standardized problem can be solved anywhere," says N. Venkatraman, chairman of Boston University School of Management's IS department. "But if you need to understand the business and create value, you must be here. It's very difficult to understand the business context of IT remotely." Supporting a new product launch, for example, requires close observation and fast response—both impossible if the work is done halfway around the globe.

"If it can be codified, it can be done remotely and supported by IT," says Travis. "If it is still tacit and requires a lot of unstructured discussion, then it must be done here."

That need to keep certain activities close to home is one reason why many high-level IT jobs will remain in the United States. Speed and ease of management are two other factors. "Offshore outsourcing ultimately represents a certain loss of control," says Travis. "It is very dependent on the ability to manage relationships, and you always give up some agility." When CIOs outsource development to India, for

[scenario TWO]

AMERICANS NEED NOT Apply

If we continue to move jobs offshore, the U.S. IT professional could become extinct

It's 2010. TaTa Consultancy Services has made New York City its de facto worldwide headquarters and opened more than 100 satellite offices around the country. No longer simply a provider of lower-level application development and maintenance work based in Mumbai, India, TaTa now provides high-level consulting and business process improvement, overtaking IBM Global Services as the leading IT services provider in the States—and the world. The company has hired a recent Nobel Prize winner to head up its burgeoning R&D business, and rumor even has it that a recently out-of-work Sam Palmisano, formerly CEO of IBM, was sniffing around for a position there.

Such a scenario might scare the dickens out of most CIOs (and probably a few CEOs), but it's perfectly plausible. Offshore companies have made no secret of their wish to compete with the likes of IBM Global Services and EDS. Changing the base of operations to the United States is possible, particularly if the U.S. government does not rein in the L-1 and H-1B visa programs that encourage the hiring of foreign workers here to oversee work done abroad.

"If Indian firms set up shop in the U.S., that's where the real threat happens," says N. Venkatraman, Boston University School of Management's IS department chairman. "You no longer have to fly someone over from India. You now have someone who's worked for the EDSs and Accentures, and now just carries a TaTa business card."

If offshore providers transform themselves into multinational corporations, watch out. They'll develop talent at all levels of IT operations. "The U.S. IT professional could become extinct if we continue to import foreign labor," says Norman Matloff, computer science professor at the University of California, Davis.

Increased standardization of IT tasks that once required localized, human skills will further the export of the American IT function. And improvements in real-time communication could boost the use of staff around the world as well.

A lack of entry-level IT employment might dissuade U.S. students. It already has. Although America saw a rise of IT college degrees awarded in the late 1990s (from 37,500 in 1998 and 1999 to 52,900 in 2001, according to the *Digest of Education Statistics*), enrollment has begun to decline again. Fairchild Semiconductor CIO John Watkins understands why. "If it looks like America is just chasing the cheapest source of labor, why would anyone want to go into IT?" he says.

Ron Hira, assistant professor of public policy at the Rochester Institute of Technology, saw the effects last fall. The new IT major at RIT missed its hoped-for enrollment figure by 200 students.

Without new entrants in the domestic labor supply, the United States could lose its competitive edge. In a 2003 report on workforce policies, the National Science Board predicted dire consequences if the United States depends primarily on foreign talent. "If you don't have a critical mass of people, you won't get innovation." says Matloff. "Companies that offshore all of their entry-level positions will be shooting themselves in the foot." They'll be forced to look elsewhere for IT talent, perhaps at higher costs.

TIPPING POINT: In response to cost pressures and global competition, IBM in 2008 relocates its base of technology operations to Bangalore.

Remember the leaked tape that came out of IBM last summer? IBM Global Employee Relations Director Tom Lynch said IBM had to accelerate the shift of white-collar services jobs, including software design, to markets such as India and China because "our competitors are doing it, and we have to do it."

Once one big name in IT does it, nearly every other CIO will too. "It's the most destructive characteristic of large enterprises, that we're like herd animals and just do what everyone else is doing," says Intel CIO Doug Busch.

Once the number of jobs available to skilled U.S. IT workers dips below a certain level and the salaries being offered hit rock bottom, "Americans just aren't going to go into the profession anymore," Matloff says. And that bodes ill for CIOs' ability to get the job done at their companies and for their own future clout in corporate America. Wholesale offshore outsourcing would also be a disaster for America's leadership in IT innovation.

"I'm not certain that the U.S. can retain its reputation as the leader in IT innovation. The leadership we've had in the past could move offshore if we're not careful," says Nancy Markle, president of the Society for Information Management. "As CIOs, we have to make sure that that doesn't happen." *–S.O.*

example, it's much harder to make changes to projects. "Anything beyond the scope of the project is impossible, unless you want to pour more money into it," says Travis.

Infrastructure, security, communication and project management issues already erode some of the cost advantage of offshoring, says Larry Pickett, CIO of Purdue Pharma. If CIOs try to go further up the value chain—sending high-level consulting services elsewhere, IT will be even more difficult to manage, he says.

The IT department at Sun Microsystems is a test case for the future. "I have a staff of IT people around the world," CIO H. William Howard says, rattling off cities from Bangalore to Beijing where his IT staff resides. "Any large company is going to position their workers where the talent exists at the best price." Howard employs about 75 percent of the IT staff he used to. By 2010, he expects to outsource 50 percent of noncore activities. He adds, "Does that mean everything will be offshore? No. The things that are core, that are tightly tied to business process and the local business community, won't."

However, John Watkins, CIO of Fairchild Semiconductor, views IT as an enabler of his business and only offshores on a limited, case-by-case basis. "It's that intellectual capital we need to protect, especially when you're as integrated in business processes as IT should be," he says.

Similarly, Cingular CIO Thaddeus Arroyo sends 10 percent of his IT work (mostly maintenance work) offshore. But he retains a U.S. staff to keep "new and more complex development close," from application development related to business process improvement to the integration and customization of off-the-shelf software. Arroyo makes these decisions project-by-project, considering such factors as capability and capacity of his U.S. workforce, the strategic nature of the work, and how closely tied a specific project is to other enterprise applications within the company. And by 2010, he says, CIOs will need to be even more judicious about what they send out the door.

"As we come out of the downturn, there will be even more potential for IT to become the business differentiator," says Arroyo. "Offshore outsourcing simply allows us to remain productive so we can deliver innovation here." In addition, the inevitable rise in labor costs in India, Russia and elsewhere could further reduce the cost advantages of offshoring.

Your IT Staff of the Future

If even 25 percent to 50 percent of offshore work does go overseas by 2010, what will the future hold for IT professionals here?

Diane Morello, a vice president and research director at Gartner, predicts that those who remain in the field will become "IT versatilists, equally at ease with technical and business issues." Travis of AMR Research calls them 50/50 professionals. Fairchild Semiconductor's Watkins brings up a similar picture: "The IT cohort of the future has to be a good technologist and protector of technology, but also be a savvy businessperson."

Will the IT professional of today *want* the position of tomorrow? Some will and some won't. "The content of jobs is changing and will

Nancy Markle, president of the Society for Information Management, believes that high-level IT jobs will remain onshore, even as more routine IT tasks move overseas.

continue to," says David Foote, president of IT management consultancy Foote Partners. "A number of people I know who are really smart stopped working in IT when they realized what it would take to be this hybrid, versatile person. They've said, I'm not interested in being a [multitasking] Swiss Army knife. I want to be a big bowie knife."

Consider this hypothetical company in 2010, for example. Paul, the Cobol programming expert who once boasted that he spent all day every day for a year doing Y2K remediation, doesn't work in the IT department anymore. He's begun a second career as a carpenter and is actually enjoying spending more time with his family. At his old desk sits Bianca, who has an MBA from Boston University. Just back from a two-year stint at her company's office in Ho Chi Minh City, Bianca has a meeting to discuss a business case for a joint marketing and IT project in the morning, and will review the post-implementation audit of the recent biometrics installation over lunch. In the afternoon, she has a Six Sigma class so that she can effectively manage the development of a CRM project at the company's Chinese outsourcer.

Like Bianca, the IT applicants of tomorrow will have to position themselves differently. "I tell my students that the job market is forevermore global, not local," says Venkatraman, who advises his protégés to consider taking a position in Ireland or India or China if only for the sheer market value of global experience. "You may think there's a shortage of your skills locally, but companies aren't going to look at local value alone anymore. You need to compete globally."

Despite downward pressure on U.S. IT salaries (the average compensation for tech workers grew just 1.7 percent from 2001 to 2002, while inflation was 2.2 percent, according to the Economic Policy Institute), experts expect wages to stabilize. But IT workers hoping for the fat paychecks and big bonuses of the past will be sorely disappointed. Normal cost-of-living increases and enough lift to keep up with other corporate positions are more likely, agree Intel CIO Busch and SIM's Markle.

Corporate America's Conundrum

While individual corporations may benefit from their increasingly global staffs, the loss of thousands of IT jobs could hurt America's ability to remain a leader in technology innovation. For without a critical mass of IT professionals in the United States, true innovation will be next to impossible.

"In 2010, we won't have gutted the IT industry in the U.S. or any other currently developed economies in favor of moving somewhere else *if* we behave the way we should as leaders," says Busch. Hopeful-

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EN TIM

Office manager escapes clutches of desk

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and work whenever and however I want. A
happy or am I happy…," Mary enthused a
first taste of freedom. Workers everywh
from CEOs to Account Managers are rej
today at the thought of
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working lives. "Mobil
Connectivity from N
means I can make be
of my waiting time a
airport," said CEO, Don Baker, "which
me more family time when I get home
Even sales manager, John Patten, was
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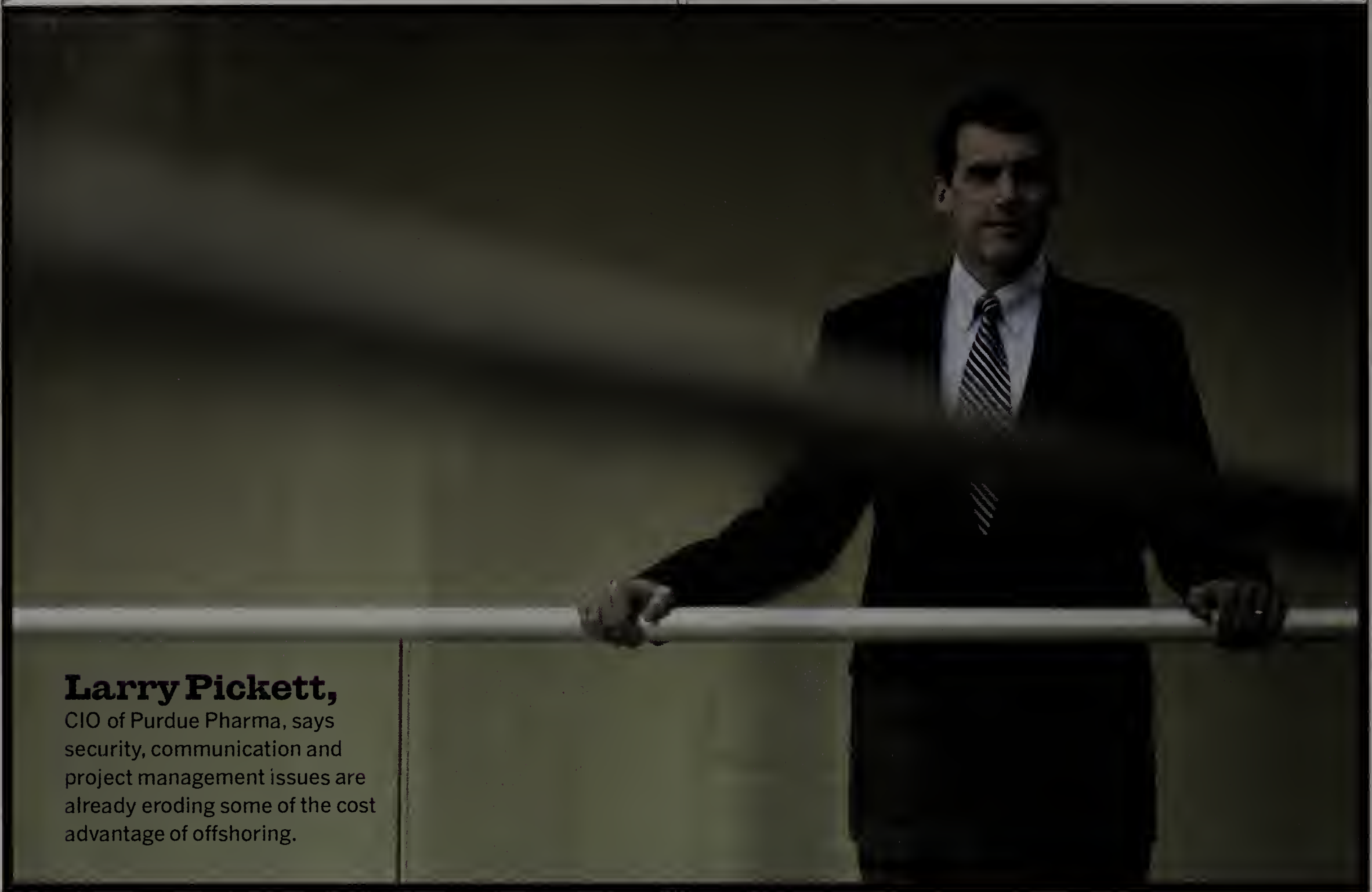

Larry Pickett, CIO of Purdue Pharma, says security, communication and project management issues are already eroding some of the cost advantage of offshoring.

ness aside, Busch admits it isn't easy juggling four major constituencies—his employees, shareholders, customers and the communities Intel operates in. "It feels like swimming upstream," he says.

Busch is currently trying to increase IT's presence in emerging economies while continuing to invest to a certain extent in his U.S. workers. "We have to compete with highly skilled IT workers in very sophisticated companies with lower cost structures. But simply substituting lower cost resources to reduce spending or deciding to solve a weak IT organization by sending the work someplace else is thoughtless," says Busch. Rather, CIOs must concentrate on improving efficiency, taking the risks necessary to innovate, and investing in tomorrow's leaders.

"CIOs who focus exclusively on chasing cost savings around the world will have short careers," agrees Sun CIO Howard. "What matters is smart sourcing that looks at the [total cost of ownership] over the long haul and the many other factors like security privacy, [intellectual property] protection, geopolitical risks, and the potential cost of having to bring it all back in."

Investing in R&D will also be important both in the government and private sector. A lot of IT innovation came out of the space program, for example. "We wouldn't have computers or the Internet had the U.S. government not invested in the research," says Ron Hira, assistant professor of public policy at the Rochester Institute of Technology. Homeland defense, security and military technology are all areas where federal funding could spur future innovation.

"But we can't wait for the government to address these issues," Busch says. CIOs in the private sector can do their part by bringing the R&D spend back in their own companies.

Putting a greater focus on R&D and continuing to recruit the best and the brightest into IT are crucial to maintaining our competitive edge as a nation. But bear in mind, the United States has a built-in advantage when it comes to innovation: As a capitalist democracy, it is relatively free of the excessive government regulations, bureaucracy and corruption that stymie IT innovation in other countries.

"The free flow of information and the freedom to develop products is really the U.S.'s ace in the hole," says Maria Schafer, a program director at Meta Group. "That doesn't exist in China or in Russia, or even in India. It's why the U.S. has always been the innovator. There's a tremendous strength in the way IT is done in the U.S." CIO

Senior Writer Stephanie Overby covers staffing issues. You can reach her via e-mail at *soverby@cio.com*.

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[scenario ONE]

A LAND WHERE Giants RULE

By 2010, CIOs will find themselves hostage to a few monopolistic vendors that keep software expensive and complex

Software vendors are like dinosaurs—they live in an environment that encourages them to grow really big to survive.

The bigger the vendor, the safer CIOs feel. It's not that CIOs are happier with the behemoths—in fact most of them hate the endless cycles of upgrades and complex maintenance and support agreements that the big vendors offer. But a big vendor promises more longevity and suites that are often easier to integrate than the best-of-breed applications from many smaller vendors. The lumbering beasts rule not because they are better or faster or more efficient than their smaller counterparts, but because they solve some—though far from all—of the CIO's integration problem.

And that's why CIOs will keep shoveling food to the big beasts and starving the little ones through 2010. The only other segment to get a healthy feeding will be outsourcers and services vendors that offer software bundled together with integration, upgrades and customizations as part of the price. Call it hyperconsolidation of the software market.

Unless Web services lives up to its promise—and we predict it won't—integration will remain a huge burden that drives up the overall cost and complexity of IT. The trend toward outsourcing will continue as many companies decide that their CIOs cannot solve the integration problem on their own. Web services will remain tightly controlled by a handful of large vendors that have no economic incentive to fix the problem. That would simply free customers to choose smaller, more nimble competitors.

Open-source software will not be the answer to integration problems either, though it will continue

BY CHRISTOPHER KOCH ■ ILLUSTRATIONS BY TAVIS COBURN

to drive down prices in selected areas of the software infrastructure. In fact, open source may turn expensive databases such as Oracle and IBM's DB2 into commodities by 2010. Smaller vendors will move toward the open-source model because it will lower their marketing costs. Rather than devoting 15 percent to 50 percent of revenue to selling, they will simply give it away, build a user base through word of mouth and then sell services and add-ons.

If open source takes hold in the big corporate infrastructure, enough momentum could build for an open-source integration technology to emerge that would rival today's Web services model. But solving the integration problem would be so complex that it's unlikely—unless someone with the technology savvy and leadership abilities of a Linus Torvalds emerges to head the effort.

Net result: Big company CIOs in 2010 will find themselves increasingly beholden to an outdated economic model for purchasing, installing and maintaining software. Fewer, bigger vendors will mean higher prices, fewer choices, higher switching costs and increasing vendor lock-in. There is a model that could bring the dinosaurs to heel: It's one where vendors would sell applications as specific, highly configurable components that upgrade automatically and integrate with any type of system at no cost and minimal effort. Companies would pay for these applications only when employees use them.

This vision, however, will not arrive by 2010 for purely economic reasons. Wall Street might throttle the stock prices of vendors that try to swear off the big up-front license fees that pump up quarterly revenue in favor of the slow drip of a pay-by-the-drink model. And the big vendors simply have too much invested in the status quo to open up their markets to smaller competitors. (For a different outcome, see "Open Source Slays Goliath," Page 58.)

"For customers, [the enterprise software business model] is like being held hostage," says Julie Giera, vice president and research fellow for Forrester Research.

The Hostages

CIOs hate the current model of buying and selling complex big-business software such as ERP and CRM. That's because the cost of integration is borne entirely by the buyer. The smaller vendors often offer more capabilities than their bigger, integrated counterparts, but because there is no standard technology to link software from different vendors together, the little guys are a riskier choice. Assembling many vendors together in a best-of-breed strategy can cost more to install and take 25 percent to 37 percent longer to change and test than large, integrated packages from one vendor, according to Forrester.

Thus, CIOs put their careers on the line in a desperate guessing game of trying to determine up front how much an enterprise package will really cost the company—if businesspeople will accept it, and if it will truly have any beneficial impact to the bottom line after months or even years of disruption and change. In a 2002 survey of 600 companies that had purchased CRM software, Gartner found that on average 42 percent of the licensed software was sitting on the shelf unused, accruing additional license fees in support and maintenance charges.

Despite such waste, customers of enterprise software are locked in to their vendors with a padlock rusted shut by years of neglect. Moving from one vendor to another is so costly as to be prohibitive—just 1 percent to 2 percent make the move willingly, according to Meta Group analyst Barry Wilderman.

While application vendors still refuse to share the burden of integration with their customers, services vendors are learning that by sharing it, they can not only pump up their consulting revenue but their software revenue too. For example, Computer Sciences Corp. (CSC) already has such a pain-sharing program for the insurance industry called Virtual Development. Customers get a copy of the software source code that they can modify but only with the help of CSC consultants. CSC agrees to incorporate all customizations into the next version of the software, relieving a huge workload for customers. No more costly rewrites of customizations each time the vendor upgrades the software. By incorporating all the changes, CSC builds a software package that could become an indispensible industry standard (or an ungodly mess if not managed carefully). Customers are protected from becoming overly dependent on CSC because they can take the source code to someone else to run it for them.

With its huge advantage in services and outsourcing, IBM could complete the hat trick by acquiring enterprise software vendors such as Siebel Systems and Oracle, and bundling guaranteed integration and upgrade services with the software. Whether the Department of Justice would agree remains to be seen. For CIOs, it would mean one great big throat to choke. If this happens, pure application vendors such as SAP and Microsoft will be at a tremendous disadvantage against compa-

CIOs put their careers on the line in a desperate game of guessing how much an enterprise package will cost and if it will truly have a beneficial impact after months or even years of disruptive implementation.

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nies that combine software and services together under one roof.

TIPPING POINT: In 2009, IBM acquires Siebel Systems, and the next year it buys Oracle's application business after open-source competition kills off Oracle's database cash cow. Meantime, HP acquires EDS in 2007 in a bid to make itself look as diversified as IBM.

Innovation Dries Up

Of course, this is just consolidation on a broader scale and does not resolve the issue of integration. Software and services vendors don't just eat their own anymore—they become omnivorous, and the line between software and services blurs completely. Will a services vendor that owns lots of software have any more economic incentive to create a set of universal integration technologies than a standalone software vendor? Probably not.

By 2010, there will be fewer vendors taking more corporations hostage. The unsolved problems of integration and IT complexity will drive acquisitions of smaller software vendors by bigger vendors eager to create one-stop shops for CEOs who want to outsource IT.

Such hyperconsolidation will probably not end IT complexity but will hide it in the shadows of fewer dinosaurs. That will do little to foster IT innovation. With CIOs locked in to services vendors that also offer a stable of software solutions, it will be even harder for small vendors to get a meeting. The dotcom bust taught CIOs a hard lesson about investing in startup vendors with good ideas and lousy balance sheets. Likewise, venture capitalists are much more leery about simply throwing money at anything that has the word *technology* in the business plan. We predict that a handful of companies will control more than 70 percent of the Fortune 500 IT budget in 2010. Small vendors will play to small companies exclusively—to the great disadvantage of big companies that won't have access to the innovative technologies that startups are developing. Small companies will be happy to nibble away at chunks of software rented to them over the Internet for a reasonable monthly fee. After all, neither vendor nor customer has to worry about integration.

CIO as Contract Manager

Hyperconsolidation won't help the CIO role, either. Reducing CIOs' strategic options makes CIOs less strategic and more like vendor managers. Vendor consolidation will pull power and strategic control away from the CIO and make the role seem less defensible to skeptics inside the company. With fewer vendors taking over bigger pieces of the IT infrastructure—and outsourcers vying for the rest—strategic knowledge and future technology planning will increasingly reside outside the company. CEOs and CFOs may wonder why they can't simply meet with the few remaining vendors themselves instead of having a CIO do it for them. And any arguments that CIOs make about maintaining

[scenario TWO]

OPEN SOURCE SLAYS Goliath

By 2010, European and Asian governments will lead the way toward the adoption of open-source software, and American CIOs happily climb aboard

Hyperconsolidation might not rule the day if governments and companies decide that it is too risky to become reliant upon a handful of vendors for their IT. By 2010, nervous governments in Europe and Asia could instead shift their purchasing and development dollars to open-source software. Overseas anxiety about vendor lock-in could be compounded by the fear that the single vendor will be American and might put European and Asian needs second. Many European and Asian companies might follow their governments' lead by choice and by necessity—if their governments mandate open source for communication, they will need to comply.

Such a trend could force sweeping changes in the model for buying and supporting software. It could even spur a revolt among CIOs who decide that they have had enough of the endless cycles of complex licensing agreements and upgrades on enterprise software. Instead, they could adopt the open-source licensing model and turn everything they've paid for out to the market for free.

"What if corporations say, 'We don't believe in licensing agreements anymore, and we're going to open source all our [legacy] soft-

Continued on Page 60

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multiple vendor relationships to avoid lock-in will fall on deaf ears. Without universal integration technologies to open up software to true price competition, what's the difference between paying steadily rising fees to separate vendors or simply giving it all to a services company?

In this kind of environment, open source will be the only economic weapon CIOs have for keeping the lid on big vendor prices and contract terms. CIOs should set aside portions of their budgets to fund open-source pilot projects inside their companies if for no other reason than to create a negotiation tool to hold over the vendors' heads. CIOs who invest the time and money necessary to assemble low-cost open-source alternatives to enterprise software packages could win back the hearts of skeptical CFOs and CEOs. It will be a long, slow process that stretches well beyond 2010, but top CIOs will no longer be unaware of how much open-source software they have in their infrastructure. Open source will move from bottom-up to top-down.

Indeed, by 2010, the strategy that will differentiate top CIOs from their more tactical peers will be one that focuses on a vendor-neutral architecture and less vendor reliance—not more. It will be a difficult task, but CIOs who focus on creating an infrastructure that is low cost, easily maintained and doesn't rely on a handful of vendors to function will have the upper hand in price negotiations with vendors and the ability to adopt innovative new solutions more quickly and easily than those CIOs who are locked in to a vendor's software release schedule. CIOs who merely pick vendors from a list will have a more appropriate title: contract manager.

Are you destined to become a contract manager? Let Executive Editor Christopher Koch know at *ckoch@cio.com*.

scenario TWO

OPEN SOURCE SLAYS GOLIATH

Continued from Page 58

ware and distribute it for free'?" asks Paul Maeder, managing general partner of venture capital company Highland Capital Partners.

TIPPING POINT: In 2006, CIOs from Europe's largest manufacturing companies decide to freeze all spending on enterprise software until the vendors agree on a standard set of truly open, free integration technologies to hook their packages together.

By 2010, open-source alternatives for complex enterprise software are encroaching from all directions. Customer unhappiness, combined with the commodity threat of open source, will drive big vendors to completely revamp their sales, pricing and installation models. Some will make older versions of their software available for free and sell support to make money. New software will come with integration and upgrades included and be paid for on an as-needed basis. But some big software vendors won't be able to make the switch, and they will be swallowed up by services vendors that offer clients paid support for open source as well as proprietary software. CIOs will once again be running development shops, but this time the work will be open source as often as it is proprietary.

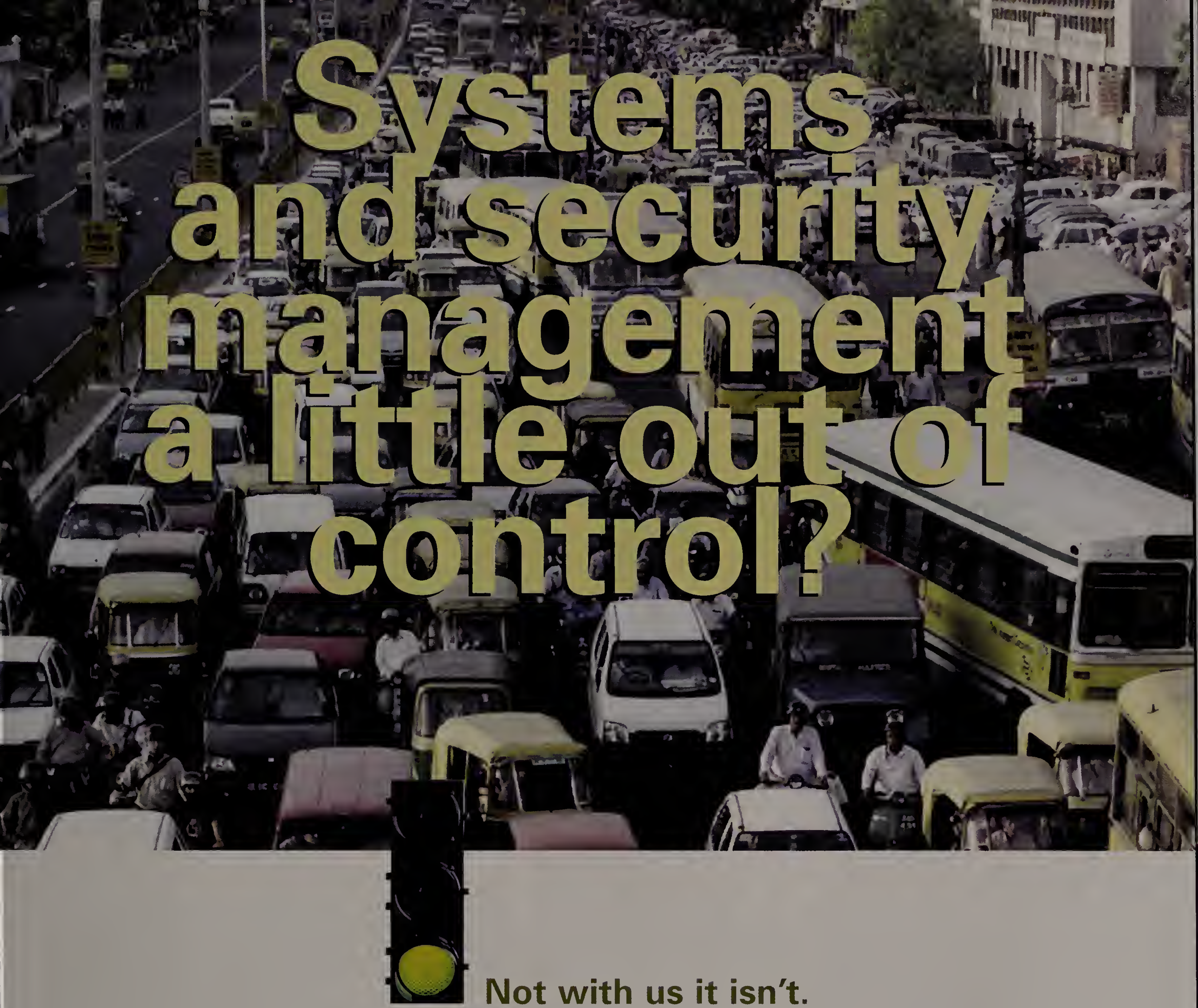
Under this scenario, CIOs will be architecture experts who take a hands-on role in creating cheap, standards-based infrastructure from which they will build highly customized IT-enabled business processes based on open-source standards.

"We'll see a model where you don't pay for the software but the services," says Nick Gall, senior vice president and principal analyst for Meta Group. "Open source and commoditization is a bottom-up process. It will move slowly up over the next 20 years to the top of the stack. It will be a slow, painful process for vendors."

There are patterns emerging today that could make this scenario possible. Like operating systems before them, complex enterprise software—core ERP functions and CRM—are sitting still like bunnies in an open field and make easy targets for open-source duplication. Already, small, very limited versions of open-source ERP and CRM exist. Some of the companies that have adopted them have invested in custom development projects to add functionality to the packages and have agreed to freely incorporate the new code into future releases.

A market will emerge to service these applications. Small developers will get paid by the line of code, but also for servicing and supporting the stuff they've written. If their client decides to make the code available for incorporation into the open-source package for redistribution, they will be able to sell services to other companies that adopt it. Open source will become a respectable route for start-ups and individual developers, and proprietary add-ons that need service will attract venture capital money to build real businesses.

Could it happen? Sure. "All you need is one good set of code out there" to act as a foundation for building the complex software systems, says Jeremy Allison, developer of Samba software. Open source avoids the biggest barrier to entering the software industry: marketing and sales. Open source needs no sales and marketing budget, only a good development leader, quality software and word of mouth for adoption. The open-source enterprise software is not free, but it is cheaper, and services vendors that install and run it for customers are happy to contribute paid developers to the cause. Innovation will flower because it will be much easier to get new projects going and to sell add-ons for existing open source. To separate the promising software from the bad, good CIOs will be more in demand—and more valued—than ever. –*C.K.*



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scenario ONE

THE Rise OF THE CIO

By 2010, the road to corporate success will run right through IT

Last year, David Bernauer became the chairman and CEO of Walgreens, the $32.5 billion drugstore chain. An accountant and pharmacist by training, he started his Walgreens career two decades ago as an assistant manager in one of the company's stores. His résumé—a few years running a shop, a few more in finance, a stint in marketing, three years as COO—is typical of many ambitious corporate execs. But Bernauer isn't your average chief executive at all. He's a former CIO.

During Bernauer's four-year tenure in the mid-'90s as Walgreens' CIO, he oversaw the development and deployment of a central system for filling prescriptions and managing patient records that is widely credited with enabling the now 102-year-old company to stay at the top of the drugstore industry food chain. The system, which frees pharmacists from routine administrative tasks, has helped Walgreens keep costs down as it pursues an ever larger share of the prescription market. And with it, the company established a new standard for customer service—enabling customers to refill prescriptions at any outlet and schedule prescription refills in advance—that competing chains now shoot for. In short, Bernauer's work as CIO

BY ELANA VARON ■ PHOTO BY FREDRIK BRODEN

has a lot to do with Walgreens' current success.

Today, Bernauer's is a rather singular story. Only a handful of CEOs have ever deployed an IT system, read the riot act to a software vendor, or put in a long night trying to get a mission-critical network up after a crash. But by 2010, plenty of chief executives will have put in a stint with IT, probably running it. There will be no doubt as to the power of the CIO as an architect of corporate success.

The Inevitability of the CIO

Because of the impact IT has had in the past decade on the way companies have grown and been managed, CIOs in 2004 have a unique opportunity to establish and fortify their leadership position in corporate America. Successful companies depend on IT to create competitive advantage, whether it's by operating an efficient supply chain, delivering top-notch customer service, or using the Internet to enter new markets and create new products or services. "Technology has continually changed the underlying economics of the way the world does business," sums up John B.W. Cross, former CIO of energy company British Petroleum (BP) and current CIO and director of the U.K. Department of Work and Pensions.

Of course, for CIOs, there's a catch. To reap the rewards of IT's central role, you're going to have to do something that gives your company a lasting competitive edge, as Bernauer did at Walgreens. And not only is it going to take a triumph, you're going to have to get the credit for it. Be "the Jack Welch of CIOs," advises Neil Fligstein, a sociologist with the University of California at Berkeley.

That's a tall order, and it comes with a high price. The CIO who *doesn't* make money for his company, who doesn't drive its stock price higher, who has never had to produce a profit and loss statement, risks losing his seat at the executive table for good.

Executives rise to power because their expertise—whatever it may be—is critical to corporate growth. Fligstein documents various periods in U.S. history when executives from manufacturing, marketing and finance took turns running the show.

During the Depression, for example, Alfred P. Sloan, a salesman who became president of General Motors in 1923, pioneered the company's strategy to produce "a car for every purse and purpose," while rival Ford stuck to making only Model Ts, available in any color as long as it was black. Sloan's marketing smarts enabled GM to surpass Ford in market share during most of the 1930s, and the star of marketing executives began to rise. By 1959, nearly a quarter of the top companies in the United States were run by former salesmen and marketing experts.

In the 1970s and '80s, the trend toward diversified conglomerates propelled financial executives to the top, Fligstein says, because they were seen as the best qualified to manage a portfolio of businesses. As US Steel (renamed USX) struggled against losses and takeover attempts through the 1980s—its leaders, first David Roderick, then

[scenario TWO]

WHATEVER HAPPENED TO THE CIO?

By 2010, the idea that the enterprise needs a top corporate officer to run IT will make as much sense as having a chief executive for the mail room

Brian Bertlin, who was CIO with Washington Group International, a $3.3 billion engineering and construction company, discovered his position was eliminated without warning in August 2003. The company outsourced its data center operations, telecommunications and desktop support. It kept a small IT department, headed by one of Bertlin's former deputies, to run enterprise systems and manage vendors. The rationale behind the decision was simple: Washington Group saw IT as a cost center; outsourcing reduced that cost.

"This company's management never really viewed IT as a significant contributor to the business," says Bertlin, ruefully. "It was more of a support services organization."

Bertlin plans to spend the next few years living in Singapore, in effect outsourcing himself. He's "building the international side of my résumé," he says, maybe as a "rent-a-CIO" or a consultant, while his wife, who works for Microsoft, does a stint there. He plans to come back in a few years, primed for another CIO job, this time at a company that appreciates IT.

The problem is, by then there might not be too many of those companies—and those jobs—around.

TIPPING POINT: In 2007, Disney turns the management of IT vendors over to a newly named director of technology services who reports to the CFO. "We think we'll get more bang for our buck if our revenue-producing executives are accountable for strategic projects," says Disney CEO Donald Duckerville, adding, "Never did understand what the heck our CIO did."

Continued on Page 66

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But the recent wave of financial scandals—Enron, Tyco, WorldCom and so on—has tarnished the reputation of the numbers guys and has given CIOs an opening to argue that skill in financial management isn't the be-all and end-all of corporate stewardship. "The kind of revolution that's occurred in information technology and telecommunications has had profound effects on the way organizations have deployed their capital and their activities," says Fligstein. "Clearly the person in the organization that can make the most claim to being able to manage that dependency [on IT] is the CIO."

TIPPING POINT: In 2007, the CIO at insurance giant AIG outsources IT infrastructure operations. This lets the CIO turn her attention to ways AIG can use technology to improve its competitive position. Within a year, AIG captures additional market share, and Wall Street credits IT-enabled business process improvements for the company's growth.

The CIO Knows Best

By 2010, every sizable company will be part of a network of suppliers and service providers, both onshore and off. All business processes will be, essentially, collaborative efforts among partners. Technology and business futurist Don Tapscott, who coauthored *The Naked Corporation*, says this trend toward the "unbundling" of vertically integrated corporations means their success will depend on how effectively they use technology to communicate and collaborate. By 2010, he says, a company will either have an effective CIO or it won't be in business. Most companies in 2004 are already part of some technology-enabled network, whether it's a U.S.-based manufacturing company that contracts with suppliers in China or an IT department with programmers in Russia. It's unthinkable that any company could successfully coordinate those networks for very long without a CIO.

The result is that the CIO in 2010 will be responsible for much more than technology. With her companywide view of how business units and contractors are interconnected, she'll drive improvements in business processes. Or she'll be put in charge of the supply chain or logistics because IT is critical to operating those functions effectively. Her leadership in integrating systems will make her a leader in extracting more value from corporate data, and she will know the most about who requires information, how they need to access it, and how best to protect it. And her expertise as a manager of offshore contractors will put her in charge of all her company's most critical relationships. Whatever her specific portfolio, she'll understand how her company can best take advantage of IT to create new products and services. And she'll be involved in every strategic decision because no new initiative can be executed successfully without her.

[scenario TWO] WHATEVER HAPPENED TO THE CIO?

Continued from Page 64

Warning Signs for CIOs

By 2010, most companies may view IT in the same light as Bertlin's former bosses, and the few CIOs left will spend their time wrestling with their ERP vendors over maintenance fees instead of looking for ways technology can create revenue.

Today, at plenty of companies, technology is still viewed as a support function. Even in the heyday of dotcom experimentation, it was often a marketing executive or supply chain guru who plotted the company's online strategy. CFOs, meanwhile, have a big advantage in the influence game because they're in a unique position to evaluate what makes companies profitable, says Neil Fligstein, a sociologist with the University of California at Berkeley who has charted the rise and fall of corporate executives.

The view of IT as a cost center could render the CIO an endangered species. Paul Saffo, director for the Institute for the Future, says that although "information is strategic and information systems are central to companies," future decisions about using technology to create value from corporate data won't necessarily fall to the CIO.

"CIOs as a community have never done a terrific job explaining what they do to the rest of the company," adds Saffo. As a result, they're vulnerable to being marginalized on one hand by expense-conscious CFOs and on the other by tech-savvy managers of business functions—such as the marketing vice president who thinks it should be his job to decide how the company will use CRM. Either way, by 2010, if CIOs don't get better at projecting themselves into the center of the corporate decision-making process, they may find that if they still have a job, it won't be steering the company toward its next competition-crushing opportunity. It will be taking orders and putting out fires. *–E.V.*

The Job Expands

Many companies already realize that CIOs can and should be responsible for developing company strategy, that they can and should be in charge of the supply chain, that they can and should run a shared services organization. James Cash, a retired Harvard Business School professor, who serves on corporate boards and meets quarterly with a group of 38 CIOs, observes that in companies that identify IT as a strategic resource (meaning, smart companies), CIOs spend "an enormous amount of time" outside the office, meeting with suppliers, buyers, customers and regulators, and performing due diligence on acquisitions, much like equity analysts. "When you look at the skills and knowledge required [to do that]," says Cash, "they look a lot more like a traditional business manager." Or like a CEO.

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This past year, despite flat to reduced IT spending and a big uptick in outsourcing, there was plenty of evidence that CIOs were poised to gain credibility and stature. For example, in 2003:

- Many companies turned to nontechnologists to be their CIOs, or were grooming CIOs for future leadership roles by assigning them to stints as business executives. John Leggate, who became BP's group vice president of digital business in 2000, managed oil and gas fields, ran human resources and negotiated pipeline routes through Azerbaijan before taking over IT. Before becoming CIO of Farmers Insurance in 2003, Jan Franklin spent 18 months running one of the company's largest underwriting centers—with the support of Farmers CEO Martin Feinstein, a former CIO himself.

"A lot of companies are trading up their CIOs," notes Carl Gilchrist, leader of the North American CIO practice with executive recruiter Spencer Stuart. Gilchrist reports that almost every one of his clients looking for a CIO was looking for "a very good businessperson, then a great leader, strategist and visionary."

- CIOs in 2003 were the key hire when a new CEO began a major corporate turnaround. Dana Deasy, appointed Tyco's first CIO in 2003, reports directly to chairman and CEO Ed Breen and is part of the management team attempting to rebuild the scandal-ridden company. At Mattel, CIO Joseph Eckroth was CEO Robert Eckert's first hire in 2000. Eckroth got credit not only for creating global information systems but also for initiating cross-functional teams to root out inefficiencies in such business processes as procurement. He oversaw those teams together with CFO Kevin Farr.
- CIOs were more frequently taking responsibility for extra-IT business portfolios. At privately held ViewSonic, which makes computer monitors and TV displays, CIO Robert Moon in 2003 coordinated development of the company's global business strategy, as did Tom Murphy, CIO with the Royal Caribbean cruise line. Moon says, "It became obvious that certain areas are more important to us—like the global supply chain and also the use of the Internet." In this way, the IT department, and Moon along with it, became central to ViewSonic's business objectives. Meanwhile, retailer Best Buy Executive Vice President and CIO Marc Gordon is also responsible for logistics, and at ConocoPhillips, CIO Gene Batchelder also has the title of senior vice president of services. He oversees facilities management, financial services and procurement, among other internal services.
- In 2003, many companies appointed CIOs to their boards of directors and chose former CIOs as chief execs. Both practicing CIOs and observers of the profession agree that, as Mark Lutchen, a partner with PricewaterhouseCoopers, says, "CIOs are at the vortex of everything that's happening in the company."

The Class of 2010

The question is not whether the CIO position has a bright future (it does) but what the job description will be. To a large extent, that's up to today's CIOs. Thornton May, a futurist with the Center for Advancing Business Through IT at Arizona State University, offers one possibility: CIOs at smart enterprises will become "chief innovation officers." They'll use technology, as Bernauer has at Walgreens, to change how business is done. Or they'll create new, high-value products and services. "Great CIOs are good at triaging opportunities," says May. ViewSonic's Moon agrees, saying, "The CEO and the CIO have to be the two people who are innovators in the corporation, who can tell people to change the business process" to take advantage of new technology. Or they'll manage the complex networks that bind huge conglomerates, the "unbundled" corporation of the future.

The challenge for CIOs now, says Paul Saffo, director for the Institute for the Future, is to tell their story. CIOs have a "huge opportunity to finally become central in the business," says Saffo. "This is the CIO's opportunity to lose."

Senior Editor Elana Varon covers public policy and financial issues. She can be reached at *evaron@cio.com*.

Faces to Watch

Right now, these CIOs are defining the job for the future

GENE BATCHELDER, CIO, Senior Vice President of Services, ConocoPhillips

Batchelder is a multiple-threat executive, running procurement, financial services and facilities along with IT. While it's unusual today to find a CIO with such broad responsibilities, this is the future for those CIOs bold enough to risk looking beyond IT.

MARC GORDON, Executive Vice President and CIO, Best Buy

Gordon is in charge of logistics for the national retailer—clearly a key role. His position is one indicator that CIOs are poised to take on those critical business functions that have a strong IT component.

JOHN LEGGATE, CIO, British Petroleum

An innovator who has helped transform BP's global business processes, Leggate plays a big part in the company's decision making on environmental policy. His current role, combined with his extensive business experience, would qualify him for the CEO slot, even though those who know him say that isn't his ambition. But CIOs who aspire to the top spot would be well-advised to study Leggate's career trajectory. *–E.V.*

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The Future of Security

scenario ONE

AFTER THE STORM, Reform

In 2010, information security will be much better than it is today. But between then and now, everything will get inconceivably worse.

There's no need to imagine a worst-case scenario for Internet security in the year 2010. The worst-case scenario is unfolding right now.

Based on conservative projections, we'll discover about 100,000 new software vulnerabilities in 2010 alone, or one new bug every five minutes of every hour of every day. The number of security incidents worldwide will swell to about 400,000 a year, or 8,000 per workweek.

Windows will approach 100 million lines of code, and the average PC, while it may cost $99, will contain nearly 200 million lines of code. And within that code, 2 million bugs.

By 2010, we'll have added another half-a-billion users to the Internet. A few of them will be bad guys, and they'll be able to pick and choose which of those 2 million bugs they feel like exploiting.

In other words, today's sloppiness will become tomorrow's chaos.

The good news is that we probably won't get to that point. Most experts are optimistic about the future security of the Internet and software. Between now and 2010, they say, vulnerabilities will flatten or decline, and so will security breaches. They believe software applications will get simpler and smaller, or at least they won't bloat the way they do now. And they think experience will provide a better handle on keeping the

BY SCOTT BERINATO ■ ILLUSTRATION BY JOHN WEBER growing number of bad guys out of our collective business. Some even suggest that by 2010, a software Martin Luther will appear to nail 95 Theses—perhaps in the form of a class-action lawsuit—to a door in Redmond, kicking off a full-blown security reformation.

The bad news is that this confidence, this notion of an industrywide smartening up, is based on the assumption that there will be a security incident of such mind-boggling scope and profoundly disturbing consequence—the so-call digital Pearl Harbor—that conducting business as usual will become inconceivable.

The Digital Pearl Harbor: What It's Not

The phrase *digital Pearl Harbor* was first seen in print in 1991. D. James Bidzos, then president of RSA, said the government's digital signature standard provided "no assurance that foreign governments cannot break the system, running the risk of a digital Pearl Harbor."

By 1998, the term's use was reasonably common, a dark, lowering cloud on the horizon of the Internet revolution. *Newsweek*, in an article from that year, suggested it would come in the form of a "sophisticated attack on our digital workings [which] could create widespread misery: everything from power failures to train wrecks."

Since then, the phrase has become bromidic to the point that former cybersecurity czar Richard Clarke declared that "digital Pearl Harbors are happening every day."

Whether conceived of as rare or quotidian, the digital Pearl Harbor's definition has remained constant: It's a computer outage, a big one, a physically and financially damaging one. More recently, it has become a shorthand way to say, "Terrorists will take down the Internet."

In either case, this definition is wrong. Not only is it wrong, it's not even useful.

"I hesitate to even use the term," says Jeff Schmidt, an elected member of the FBI's InfraGard national executive board. "It's come to mean any attack that's massively inconvenient. But I don't think they merit the term *digital Pearl Harbor*."

"We need to distinguish between the mischievous and the malicious," says Darwin John, who served recently (albeit briefly) as CIO of the FBI and is considered one of the godfathers of the CIO profession. "We've tolerated the attacks until now because they're mischievous. The malicious attack will be the one that moves the public consciousness, and it's so much harder to know what that attack will be."

It's much easier to know what a digital Pearl Harbor *won't* be. Taking down the Internet or ATM networks, compromising the Social Security database, even hacking into the electric grid—Schmidt and others argue that while each event may be *part* of a digital Pearl Harbor, none qualifies in and of itself. None would galvanize society, spurring it to action.

And it needn't be a terrorist attack. Open networks coupled with vulnerable software make it more likely that a transformational event will arise from a more banal source, like a motivated group of computer experts, a common thief or, most fickle of all, an accident.

The coming digital Pearl Harbor doesn't even have to be a single event. Thinking about the nature of disasters, Software Engineering Institute fellow Watts Humphrey consulted nuclear power people. "I talked to one guy who did nothing but review incidents," Humphrey says. "And typically, these kinds of disasters result from a combination of many smaller events that each seem highly unlikely. But they all happen at once to create unforeseeable consequences."

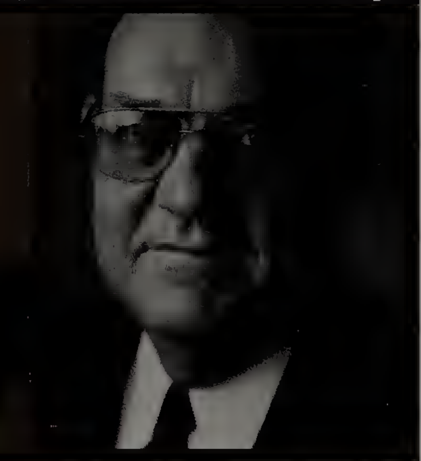
That's the "Perfect Storm" theory, and what makes an event perfect (in a negative sense) is the apparent lack of relationship between systems in a complex environment. The blackout last August was a Perfect Storm. Random, seemingly unrelated factors—an aging power grid, certain corporate decisions, a heat wave, a history of deregulation and some human errors—all came together to darken a significant chunk of the northern hemisphere.

"That's how modern systems fail," says Humphrey. "And our networks are so big and fast that things which seem damn near impossible happen every few days."

Not even loss of life necessarily means an event is a digital Pearl Harbor. Three years ago, four Marines were killed after a hydraulics failure on a V22 Osprey plane. They took all the proper measures, but because of software bugs, their plane still crashed. Few even heard of the event, never mind demanded more secure software as a result.

Those scenarios, no matter how dire, didn't rise to the level of a Pearl Harbor because they failed to inflict significant, collective psychological damage. Before Internet security changes in fundamental ways, we will have to feel as shocked and vulnerable as all Americans

"We've tolerated the attacks until now because they're mischievous. The malicious attack will be the one that moves the public consciousness. –DARWIN JOHN, FORMER FBI CIO



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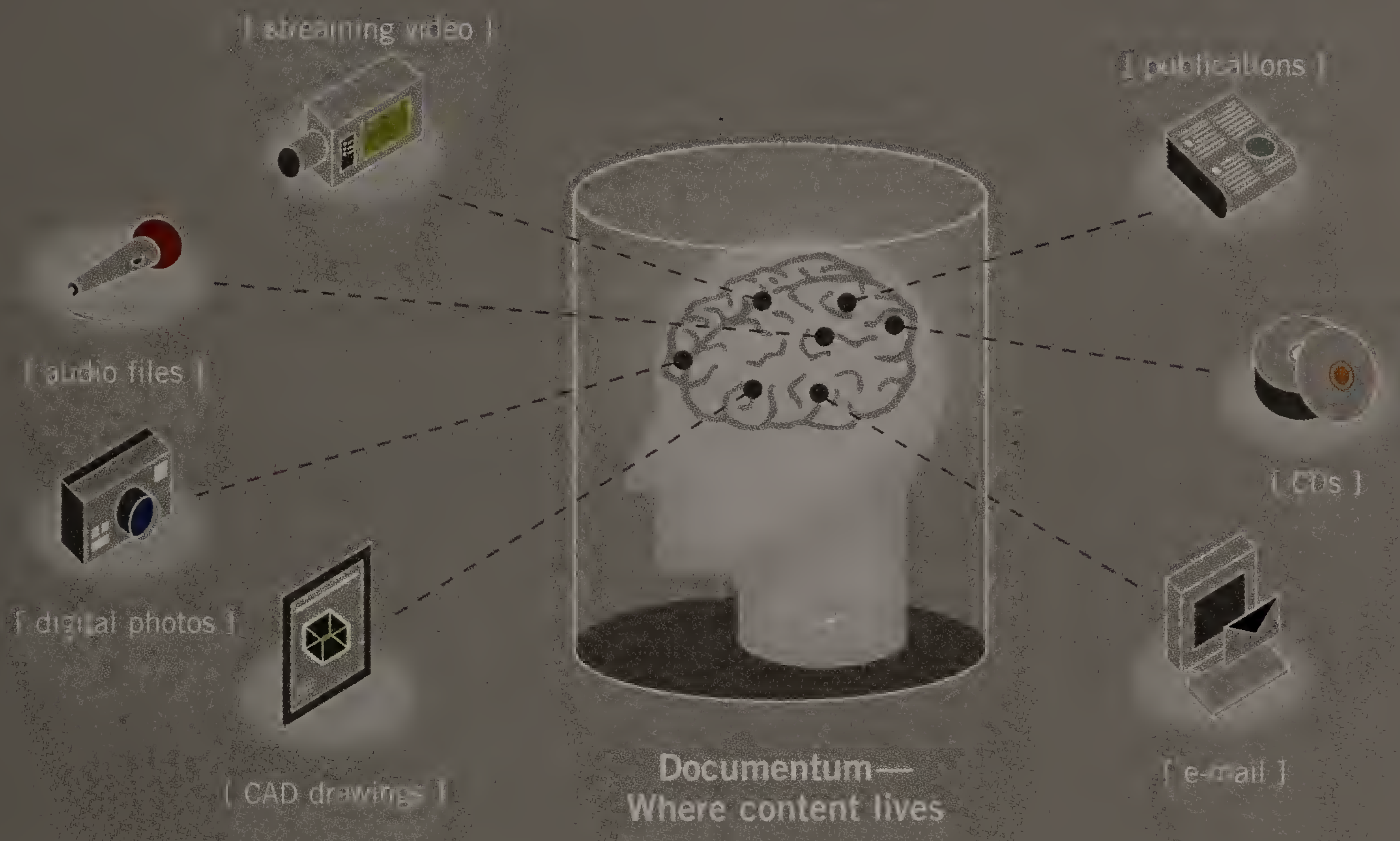

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did reading the newspaper and listening to the radio on the morning of Dec. 7, 1941 (or watching television on Sept. 11, 2001).

In a sense, this should be obvious. If digital Pearl Harbors were happening every day, they wouldn't be Pearl Harbors. They'd have a name that conveyed their seriousness, but also their ubiquity and survivability. They'd have a name like "virus outbreaks."

Still, no matter how nebulous the name, we're hurtling toward what many experts keep referring to, darkly, as the "point."

"The more complex you get, the more vulnerable you are," says Peter Tippett, CTO of TruSecure, a security services company, and noted security expert. Tippett argues that if we simply extend the present situation into the future, the level of complexity and vulnerability we would create will make a digital Pearl Harbor inevitable—and before 2010.

"For seven years, we've had these negative events," says Howard Schmidt, vice president and CISO of eBay and former vice chairman of the President's Critical Infrastructure Protection Board, and, before that, CSO of Microsoft. "And every time there's an event, it's called a wake-up call. It's like those alarms that crescendo to wake you up. We're getting to that point, where it's so loud, you wake up."

TIPPING POINT: On Dec. 7, 2008, computer systems around the world go down simultaneously. They do not come back up.

December 7, 2008: A Moment That Will Live in Cyber-Infamy

The alarm goes off in 2008. Several security experts' composite picture of a digital Pearl Harbor looks like this (although given that the event is by definition unpredictable, it will, in fact, probably *not* look like this):

[scenario TWO]

WELCOME TO THE Lockdown

If innovation and privacy have to be sacrificed for the sake of security, so be it

After the digital Pearl Harbor, one simple truth will become apparent to everyone: The surest and fastest way to avoid another one, to save lives and to make the world's computer systems secure, is to lock them up, freeze them in a permanent status quo. Put functions into chips that not only *won't* integrate with other applications but *can't*. Extensibility in 2010 is a liability, not a feature.

"That [scenario] is appealing because it's one of the simplest things you can do with computers: restrict their abilities," says Peter Tippett, CTO of security vendor TruSecure and noted security expert.

Tippett can't bear to imagine such a world. But Software Engineering Institute fellow Watts Humphrey has resigned himself to it. "If we force security restrictions, we'll dry up a lot of innovation," he says. "That's a cycle we're likely to go through."

At the same time that the integration of applications becomes unethical as well as physically impossible, there will be a human lockdown. After decades spent making access to applications universal, computer scientists and software designers will focus on preventing access. Obviously, if bad guys can't get in, they can't do damage. Even good guys will face broad strictures on what data is available to them. So there will be a surge in the development of software that blocks access to applications such as chat rooms, the Web, databases, whatever. And even features within programs, like the ability to forward e-mail messages, will be shut off. Again, the thinking is that since openness got us into this mess, only a lockdown will get us out of it.

Authentication applications will explode. The federal government will mandate that users must authenticate their identity to access the Internet itself, a sort of digital passport system for entering cyber-country.

However, as Dan Geer, former CTO of @Stake, notes, authentication can't possibly keep up with the number of people who need it and the number of transactions we try to control with it. Authentication doesn't scale.

But surveillance does. "The costs to observe are virtually zero, so it's not a question of will it exist, but what will we do with it?" Geer asks.

Enforcement of the government's security policy will come from broad, ubiquitous surveillance, both visual monitoring and keystroke logging. The adaptation of cheap wireless gadgets like RFIDs will make the tracking of people and things simple, cheap and inevitable.

Some people, perhaps the majority, will accept this as the price that must be paid to avoid another digital Pearl Harbor. Others will rue what the lockdown has wrought: an utter lack of privacy, a digital iron curtain descending upon innovation, economic stagnation, social calcification. Big Brother will arrive fashionably late, but arrive he will. Security and privacy will become dominant themes in the elections of 2010 and 2012.

Geer is convinced we're heading toward a broadly surveilled police state. "I'm sad about this," he says, "but I'm trying to be realistic."

–S.B.

It is global and instantaneous. It is so fast—seconds long—that no one knows about it until it's over. It does not attack PCs; it attacks the Internet infrastructure—such as domain name servers and routers—and industrial systems connected to the Internet, like utility control systems. It exploits an unknown or little-known vulnerability.

Five factors distinguish the digital Pearl Harbor from the virus attacks we've suffered to date.

First, it disrupts backup systems. Fragile networks heretofore have been mitigated largely with backup. Disrupt that and badness follows.

Second, it leads to cascading failures. All of those massively inconvenient attacks people previously referred to as Pearl Harbors pile up. Due to the loss of backup, corporate earnings data is irretrievably lost. This panics Wall Street and destabilizes the financial sector. People run to their banks, but the banks cannot disburse funds; their networks are down. As are the credit card networks and the ATMs.

If you don't have cash, you go hungry.

Then the lights wink out. Everywhere.

And it begins to get cold.

> "Take any mature discipline and there are standards. If I work in biological handling, I know what a Level 2 clean room is. It doesn't matter who I work for. Standards will demystify security."
>
> –JEFF SCHMIDT, A MEMBER OF THE FBI'S INFRAGARD

Panic is a key part of a digital Pearl Harbor. "If you can disrupt the flow of money and resources, that's where I'd look for incidents to become bigger than what we've experienced so far," says Michael Hershman, an international security expert who has worked in military intelligence, and who was a senior staff investigator on the Senate Watergate Committee. Hershman now runs Civitas Group, a security consultancy, with Sandy Berger, the former national security adviser to President Clinton, and Richard Clarke. "Where you see panic and money, that's where I'd look for a digital Pearl Harbor."

Third, though the attack is instantaneous, its aftereffects linger for weeks. People are hungry. Freezing. The old and the young begin to die. The strong turn against each other.

Fourth, after it's over, the attack's origin is pinpointed and the vulnerability it exploited is determined. That's another element that's been missing from most recent security events, especially virus outbreaks, and most notably in the August 2003 blackout. Blame has not been assigned; no heads have rolled. No one has even called for heads to roll. No heads can be found to roll.

Last, and perhaps most important, once the source of the event is determined, it's revealed that the loss of property and life was completely and absolutely and tragically avoidable.

2009: Recrimination, Reconstruction, Reformation

That moment—the exposure of negligence to the public—is when security will start to get better. The senselessness of the incident and the profound losses it leads to will generate outrage.

The first response is litigation. Lawyers will prosecute vendors, ISPs and others based on downstream liability; that is, they will follow the chain of negligence and hold people accountable all along it. Hackers, whether their intent was malicious or not, will be arrested and prosecuted. If the event's nexus is overseas, foreign governments will cooperate to bring the miscreants to justice.

After litigation comes regulation. Historically, regulation always follows catastrophe. In 1912, Marconi Co. operators aboard the *Titanic* were slow to receive the iceberg warnings because relays were jammed by the crush of unregulated amateur wireless users hogging the spectrum. The Radio Act of 1912 followed and, eventually, the Federal Communications Commission was formed. The crash of 1929 begat sweeping financial regulations and gave birth to the Securities and Exchange Commission.

"In the past, IT would have argued that you can't regulate because information technology is so different," says John. He doesn't buy it. "They said the same about oil. Sure enough, regulation brought order to that developing industry, and it will do the same here."

We've seen this quite a bit recently with HIPAA, Gramm-Leach-Bliley, Sarbanes-Oxley and, most similarly, the Patriot Act, which was a sweeping reaction to an attack that freaked us out.

"What follows regulation?" asks Jeff Schmidt. "Standards."

Internet security could use a lot of those, such as standard vulnerability reporting processes, standard software patches, a single naming convention for alert levels when viruses are discovered, standard secure configurations of software.

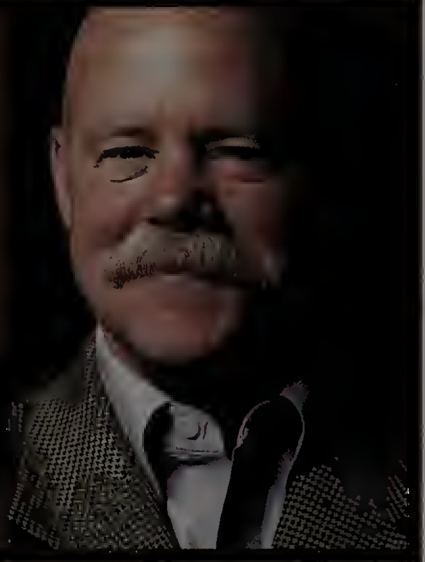
"Take any mature discipline and there are standards," Jeff Schmidt says. "If I work in biological handling, I know what a Level 2 clean room is. It doesn't matter who I work for. Standards will demystify security."

The final phase of the corrective response to the digital Pearl Harbor will be a reformation, a cultural shift toward better, more proactive security. If the first two stages represent our pound of cure, this is the ounce of prevention.

Of course, to have a reformation, you need a Martin Luther, a leader who's not only willing to push for radical change, but who also has a plan. Perhaps a rebel within Microsoft who sacrifices his career to change the culture and practices he's experienced firsthand. (Luther, it should be noted, was just such an insider who was disgusted by the pope's practice of generating revenue by selling indulgences—that is, pardons from purgatory.) Or maybe it's an outsider with a lot of passion for the issue and money to support his cause.

In the case of a security reformation, this leader would borrow from the ideas of experts who already have reformist ideas, like SEI's Humphrey. Known as the Edward Deming of software, he has implemented and proposed radical changes to the way software is made. Humphrey is unsparing in his criticism of contemporary software security. We're letting creative artists build bridges, he says, then trying to stabilize them with unlicensed laborers while they're collapsing.

> **"We've been resilient, but the ugliness is lurking. Popeye once said, 'I've had alls I can stands and I can't stands no more.' We're reaching that point."**
>
> –PATRICK GRAY, DIRECTOR, INTERNET SECURITY SYSTEMS' X-FORCE NATIONAL EMERGENCY RESPONSE



Included in Humphrey's blueprint for a security reformation are new software development processes that change the governance and structure of software engineering to favor security. Called Team Software Process (TSP) and Personal Software Process (PSP), they entail a fundamental shift in software development practice from the regular army model—top-down command—to a special operations model wherein a small group is given objectives and let loose to fulfill them. "I want the technical community to become professionals," Humphrey says, "to say, This is how we do our job."

TSP and PSP have already been found to reduce coding errors by factors of up to 10 or more. Microsoft tried it and reduced bugs within a 24,000-line program from more than 350 to about 25.

Humphrey also has conceived of even more radical changes, including a software engineering curriculum modeled on medical school, complete with professional internships.

A full-blown security reformation would mark a triumph over the "tragedy of the commons," the dilemma that bedevils Internet security today. A principle in ecology, the tragedy of the commons states that individual short-term benefit trumps collective long-term benefit. That is, I will let my sheep graze on the commons to increase my personal wealth even if it contributes to the degradation of the commons as a whole.

In security, individual companies make, buy and deploy software to gain a competitive edge, even as the networking of that software degrades security for everyone. There's no incentive for any single company to improve security for everyone, especially if doing so threatens the company's competitive position and wealth.

"By 2010, there will be a growing general awareness, a link between what individual users do and how that affects the national interest," says Tom Longstaff, the manager of the CERT Analysis Center, which takes in data on the Internet's swelling number of vulnerabilities and security incidents. "I think of World War II," he adds, "and rationing rubber and nylon. After a momentous event, there's often a subjugation of the tragedy of the commons."

A security reformation will not take place overnight. Longstaff believes that even with a digital Pearl Harbor in 2008, we'll be only 20 percent reformed by 2010. Whit Diffie, Sun Microsystems' CSO, suggests a 10-year time frame before we should mandate zero tolerance for insecure software and enforce strict liability laws. Even Humphrey says, "I'm hopeful, but the issue is one of time."

This vision of security in 2010 is a rosy picture painted with cynical strokes.

"God, we've been resilient," says Patrick Gray, the director of the Internet Security Systems' X-Force National Emergency Response, "but the ugliness is lurking. We're reaching our limit with the angst. Popeye once said, 'I've had alls I can stands and I can't stands no more.' We're reaching that point."

And when we do, everything will fall apart. And then, and only then, will it begin to get better. CIO

Senior Editor Scott Berinato writes frequently on software security. He can be reached at *sberinato@cio.com.*

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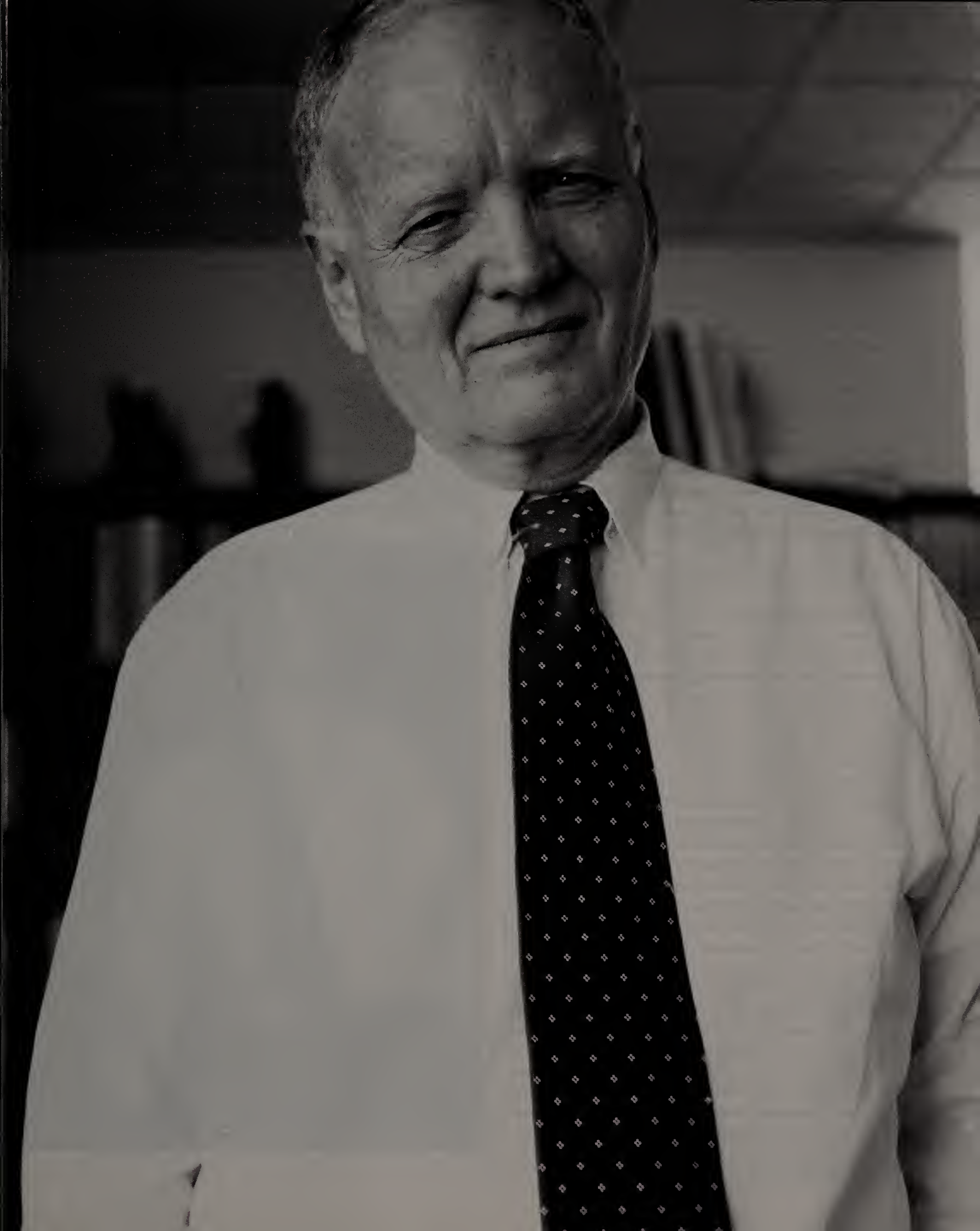
Interview with Lester Thurow

WE CAN SHAPE THE Global ECONOMY

Economist Lester Thurow says globalization can have long-term benefits for all Americans, but only if we move to shape what happens during the next few years

In a discipline dominated by cautious intellectuality, Lester Thurow, the Lemelson professor of management and economics at MIT in Cambridge, Mass., enjoys an international reputation as a social and economic provocateur. He has written more than a dozen books about economics and politics, in which he challenges mainstream views about America's ability to foster international economic cooperation and narrow the economic gap that divides us from the rest of the world. His most recent book, *Fortune Favors the Bold,* calls on American business and political leaders to step up and help shape the inevitable world event of globalization. In this interview with *CIO*, Thurow tells us how the United States routinely fails in economic negotiations and why President Bush may not be returning to the White House in 2004.

BY ART JAHNKE ■ PHOTOGRAPHY BY LEAH FASTEN



CIO: Outsourcing is on everyone's minds these days, and it's an issue that places CIOs in the middle of a painful conflict. The CEO wants the CIO to save money, and CIOs know that they may be able to save money by outsourcing, but their IT staffs live in fear that their jobs will be shipped overseas. What's a CIO to do?

Lester Thurow: Well, I think they should do two things. One, they should sit back and ask, What is the long-term strategy compared with the short-term strategy? Because while you can cut costs now, you may not have the ability to do that in the future. The other thing is CIOs need help. They need governments to get the different currencies to a value that will seem rational in the long run. Right now you can move some of your work to India or China, but the value of currencies can change radically. Right now those countries are an inexpensive place to go, but when that changes you just have to move the work back.

How long will it take for the cost of labor in India or China to approach the cost of labor in the United States?

The problem is, we don't know. I don't think it could take another 20 years, but this [discrepancy in labor costs] has already gone on for 20 years without much change. Still, you have to consider that part of the reason the value of the dollar doesn't change is you've got the Japanese government out there preventing it from changing.

What can we do about that?

We can offset it. If the Japanese government buys dollars to hold down the value of the yen, we can simply sell more dollars. For every dollar Japan buys, we will sell a dollar, and damn it, we are going to have market exchange rates, and we are not going to let the Japanese control the value of the dollar to the yen.

If we can do that, why haven't we?

Partly for the same reason we haven't done that with China: We want their help on North Korea. And one of the reasons why the United States is a very poor negotiator on these economic things is we have other fish to fry, and the rest of the world doesn't care about North Korea. The rest of the world bargains about economics. India doesn't care about North Korea. So what typically happens in the American government is the economic dimension in a negotiation is well down the importance list. So if you want China to help you on North Korea, you can't beat up China [for keeping the yuan low in relation to] the dollar.

In fact, I don't think we should be beating up China on the currency issue at all. The Third World should take it up. That should be the job of [U.N. Secretary-General] Kofi Annan, because what's really happening at the moment is not that American jobs are moving to China, but that our television set manufacturing in Mexico is moving to China. So our deficit with Mexico gets smaller, and our deficit with China gets bigger, and the American trade deficit with the Third World is not going up any faster than it has in the last 10 years. China is not the source of the dollar problem, so it makes no sense for a group of people with a per capita income of $40,000 to go beat up on people with a per capita income of $1,000 and say you're growing too fast. Tell me where the moral leverage is in that.

One of the troubling things happening now is American companies are sending foreign workers into American factories where they are learning processes and taking the work back to India. That's why some CIOs would like to see our legislators control visas in order to control outsourcing. Is that the right approach?

The way you have to handle this is once again to deal with the currency imbalance. If you can get the currencies balanced right, then you can get a better idea of what work is sensible to do here and what is sensible to do somewhere else.

It's very hard to do otherwise. It's very hard to control knowledge. And it's very hard to have a monopoly on knowledge, because if the Indian workers can't go to the American factory, they can go to the factory in China or in Europe, and they can figure out what the process is and then write the software to do whatever they have to do. Or someone in America is assigned the job of telling them.

Do you think there is there some xenophobia involved in Americans' concerns about foreign workers taking their jobs?

There is some of that instinctively in every country. People blame the foreigner, but the real problem is that we're not creating local jobs. The real problem is that when the dotcoms crashed, about 1 million IT professionals lost their jobs, and that had nothing to do with China. Today, about 800,000 of those people are still unemployed. Some of them have not gotten new jobs because of outsourcing to India, but that is not the source of their problem. The source of their problem is we need to create sustained economic opportunities to absorb those people who lost their jobs when the dotcoms crashed, and we haven't done that.

> **People blame the foreigner, but the real problem is that when the dotcoms crashed, about 1 million IT professionals lost their jobs.** –LESTER THUROW

What should we be doing to create economic growth that we're not doing?

Well, we could orchestrate things. The Bush administration could reprioritize their economic policies, and that's something that I'd like to see them do. I'd like to see them take those tax cuts back that are scheduled in 2006, 2007 and 2008, and put them into 2003 (retroactively) and 2004. And then we would have a path back to a balanced budget by 2007 and 2008. That would give you a lot of bang in terms of fiscal policy now. It would also allow interest rates to go down because what's happening now is Alan Greenspan is keeping short-term interest rates down because the market is seeing these budget deficits in 2006, 2007, 2008. That's why 10-year bond rates have gone way up. Nobody's going to lend money for 10 years unless they think interest rates are going to be low for the entire 10 years. If you saw a budget surplus in 2008, you'd probably think interest rates are going to be low in 2008, and those 10-year bond rates would not have gone up. So you can organize an American economy that grows at 8 percent a year, and with that growth you can get these people back to employment.

But how many of them will they get back into employment at the same wage scale they left?

Well, that depends on exactly where the growth comes, and it depends on how old you are. The truth of the matter is, if you're laid off and you're over the age of 55, no matter what happens to the economy, you are very unlikely to get a new job that's as good as the job you lost. Companies don't want to hire people over 55 because of health-care problems and pensions. There is no question that the process is going to generate some long-term losers. The question is how many. On the other hand, if you're 35, you have every reason to believe that you will get a job as good as the one you lost.

If the Bush administration does nothing, what will the economy look like in eight years?

The answer is if the Bush administration doesn't do something, there won't be a second Bush administration. Professional white-collar outsourcing is so scary—and so many of the people affected are Republican voters—that the issue is going to blow Bush out of the water.

You warn in your book that wages around the world will equalize. When that happens, how will Americans maintain the standard of living that they are accustomed to?

Well, what you want to happen is for the wages of other parts of the world to go up, and ours not to come down.

But can the wages of the entire rest of the world go up and our wages remain the same?

If we shape it, and if we do it at the right pace, the answer is yes. If you are basically growing our productivity, then wages are going to go up. Now the wages of IT workers might falter, but average American wages are going to go up.

Can the entire world really enjoy the standard of living that Americans are accustomed to?

Sure, because the entire world will have the American standard of productivity. You earn that standard of living by producing as much as Americans do.

The final thesis in your new book is that we can in fact shape globalization. Do we really have the power to do that?

Well, there is a whole set of things that we can do. We have to worry about these global trade surpluses and trade deficits; we have to worry about intellectual property rights, and we have to worry about education at home and abroad. We also have to get our fiscal and monetary policies right. There is no silver bullet, but there are many things that we can do to make globalization more inclusive than it would be if we just sat back and let it happen.

The fact is: Globalization is coming. You couldn't stop it if you wanted to. Probably, if you don't do anything, the pluses will still exceed the minuses. History shows that in the last seven years, 60 percent of the world's GDP has occurred inside the United States. So, in that sense, we are the big winner.

Can CIOs play a role in shaping globalization? Let Web Editorial Director Art Jahnke know what you think at *ajahnke@cio.com*.

By 2010, will technology have terminated most IT jobs?

Rise of the Machines

BY JOHN EDWARDS

JOB IMPACT | Technology is getting smarter, nimbler and cheaper—a trend that could signal trouble for IT professionals.

For years, IT specialists sat dispassionately as one career category after another succumbed to the ravages of automation. The list is diverse and virtually endless: Typesetters, receptionists, file clerks, movie stunt performers, assemblers, travel agents, librarians and hundreds of other occupations have all, to a greater or lesser extent, had their numbers trimmed by technology.

Now, in the first years of the 21st century, it's the IT professionals' turn to anxiously look over their shoulders and wonder if some box, sitting silently in a windowless room, will soon send them on a trek to the unemployment line. "For many, the only way will be down the economic ladder," says Alan Pelz-Sharpe, a software and services analyst at technology research firm Ovum. "They don't have easily transferable skills and, at the same time, they've got very high economic and social expectations."

Cutting-edge technologies, such as autonomic computing and artificial intelligence (AI), threaten to shrink the ranks of IT workers in the years ahead by automating routine jobs and accelerating the execution of advanced tasks. Falling hardware prices and widely deployed

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technologies such as the Internet and Web-based software may also send many IT professionals packing by allowing employers to replace employees with lower-cost technology. "The commoditization of hardware in particular has made it very clear that the most expensive thing in the data center right now is the people," says Ted Schadler, a principal analyst for Forrester Research. During the next few years, large numbers of smart, cheap machines—interconnected over the Internet—could prove to be more attractive to employers than skilled human beings and all of their bothersome demands for paychecks, health benefits and vacation days.

Jobs on the Fly

To a large extent, IT workers are victims of their own hard work and talent. During the past several decades, they have strived to create systems that are comprehensive, faster, simpler to install, and easier to operate and maintain. Now that many of these systems are in place, IT staffs are set to shrink—perhaps permanently. "The job market is going to be hit very badly and very negatively," says Pelz-Sharpe. "More jobs will be outsourced, and more and more jobs will be outsourced offshore."

Although offshoring is an economics-driven trend, technology is an important enabling factor. High-speed Internet connections now allow employers to easily shift jobs away from high cost-of-labor countries, to places like India where IT specialists, including software developers, database administrators, support personnel, network and systems managers, and technical writers, are willing to work for a fraction of the salary paid to U.S. workers with equivalent skills.

Simpler Software

If the government doesn't decide to curtail outsourcing, the sudden emergence of Web services software could create another threat to IT professionals worldwide. Web services are self-contained, self-describing, modular applications that use the Internet to perform functions that range from simple information requests to complicated business processes. What sets Web services technology apart from earlier component-oriented software development strategies is its foundation of widely accepted industry standards.

Prior to Web services' arrival, teams of IT workers were necessary to develop, deploy and manage the custom software that linked together the various applications used by multiple internal and external organizations. Now, with standardized Web services components rapidly falling into place, the task of creating, operating and maintaining system-to-system connections is becoming simpler and far less labor-intensive. "Web services is obviously where a lot of things are going," says Ovum's Pelz-Sharpe.

Thanks to Web services' "create once, expose to many" foundation, even complex links involving long-running transactions and several trading partners or suppliers can be established without the need for specially designed software. Standardized Web services connections also tend to be easier to maintain and monitor than custom-developed links. All of this means that during the next few years there will likely be a diminished need for highly-skilled software developers and network administrators, as well as the people who manage them. Replacing this large group of workers will be a smaller number of people who can plug in standardized software components and monitor the software that automatically manages Web services links.

While still in the mostly marketing phase now, utility computing—the idea that computing resources will eventually be as abundant and as easy to tap into as electricity—

> "The most expensive thing in the data center right now is the people."
>
> –Ted Schadler, principal analyst, Forrester Research

Innovate or Die

To fight job losses caused by advancing technologies, IT professionals must become innovators and supporters rather than organizers and maintainers, says futurologist Ian Pearson of British Telecommunications.

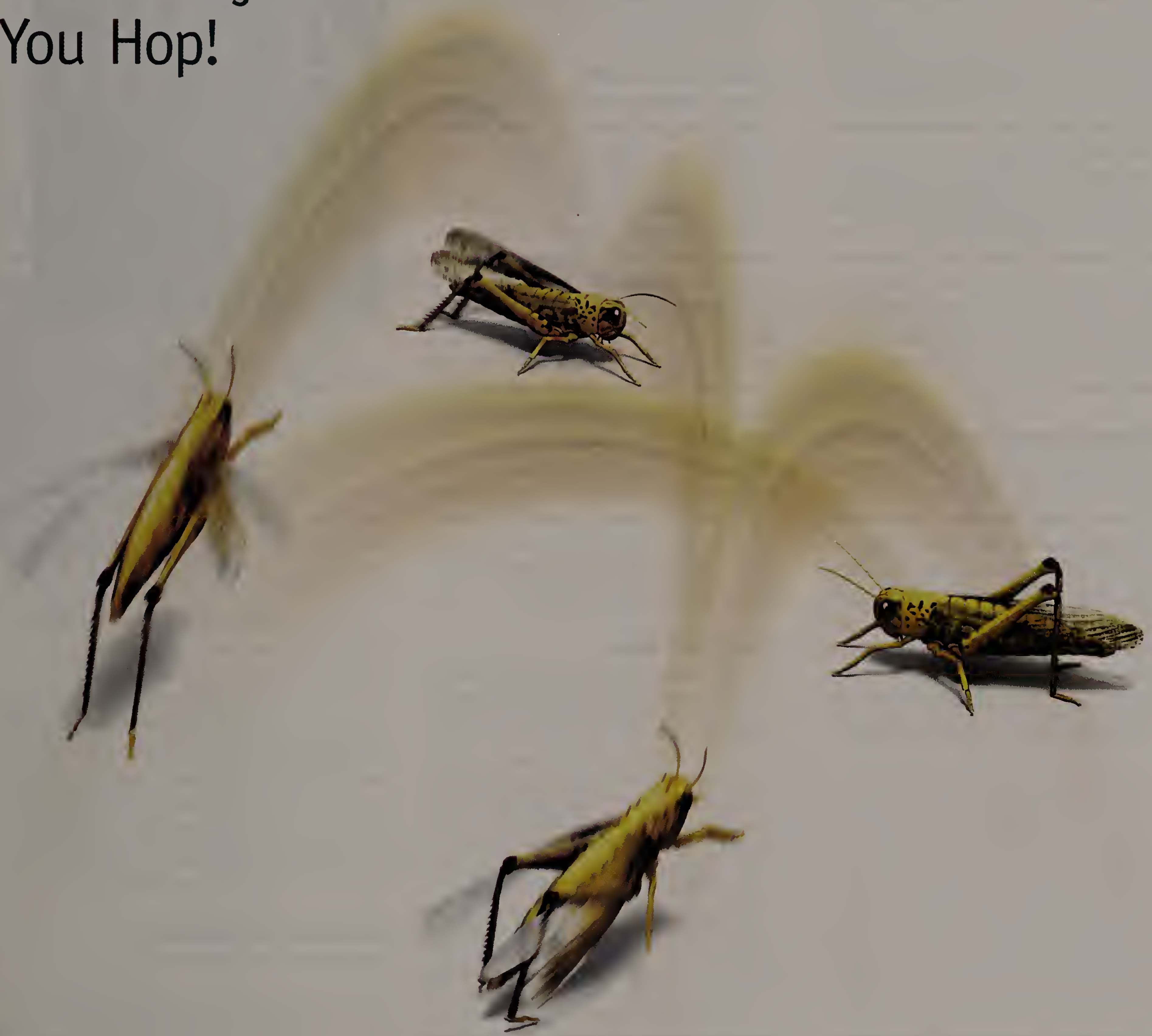
He believes that as computers become increasingly capable of managing themselves, IT professionals will find themselves gradually transitioning into the roles of technology innovators and interpreters. "We need to look around for jobs that enhance the way the IT infrastructure is used," Pearson says. "We could retrain people to produce things like virtual environments or new communications tools."

Joy Hughes, vice president of IT and CIO of George Mason University in Fairfax, Va., already senses a changing mission among her managers and staffers. The school recently deployed a Web-based course management system that's designed to make it easier for faculty members to place their courses online. "We have more people supporting the course management system than we did writing custom software for the few faculty members who put courses online five years ago," she notes.

"We'll be using more [IT professionals] in the future to help people get the most out of the IT that's available to them," says Pearson. "They're moving up the value chain into human interaction."

As technology grows more sophisticated, there will also be a diminished need for IT workers with deep technical knowledge, predicts Dianne Morello, a research vice president at Gartner. "There will be a broader demand for people who are versatile in a variety of different areas than those who are continuous specialists in only one area," she says. Morello believes that this trend will gradually raise the bar for IT workers: "It may, in fact, even turn them into business IT professionals instead of just technical folks."

–*J.E.*



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also promises to reduce the number of IT professionals, particularly among small and midsize enterprises. "You could, conceivably, have your key people armed with laptops, and they don't even have to be in a physical office together," says Richard W. Samson, director of "user empowerment" consultancy Era-Nova Institute. "Companies may not need an IT department any more."

Within large enterprises, the widespread adoption of utility computing would likely mean the consolidation of separate IT units into streamlined, centralized organizations. That would mean fewer management-level jobs. Samson observes: "Why have three top guys and three departments when you can combine everything into one department that's more efficient?"

Computing on Autopilot

Even more employment trouble is brewing from another emerging technology: autonomic computing. The model, touted by IBM, describes systems that automatically configure themselves to evolving conditions and are self-healing in the event of failure. A similar concept proposed by Forrester Research, called organic IT, involves inexpensive computing infrastructures featuring redundant components that automatically share and manage enterprise computing resources—software, processors, storage and networks—across all applications within an enterprise.

While mostly in the marketing phase now, if either concept gains traction, systems would require less human intervention for routine operations. That would mean a reduced need for the IT specialists currently charged with tending to complex and difficult-to-manage systems. As a result, companies could abandon large numbers of redundant IT managers in favor of smaller groups of troubleshooters to monitor automated management software, notes Forrester's Schadler.

The savings in terms of lower labor costs are potentially substantial. On the storage front, for example, Forrester estimates that an administrator can currently manage approximately 5 terabytes. By 2007, with the help of self-managing systems, that same administrator will be able to manage in excess of 100 terabytes—a rate of efficiency gain that far outstrips the growth in storage demand.

While autonomic-type computing represents a legitimate threat to IT jobs, the impact of such systems might not be felt for some time. The complex task of building autonomic technology may prove to be more challenging than many people currently believe, notes Ovum's Pelz-Sharpe. As a result, software engineers may still be several years away from creating anything close to self-managing systems. "My belief is that it's a lot further down the line than 2010," he notes. "Delivering on that vision is going to be far more difficult than is currently realized."

Things to Come

As if Internet-driven outsourcing, standardized software and self-managing systems weren't enough for IT workers to fret about, advanced artificial-intelligence-powered computers may cause even more future employment grief. "What we can expect over the next five or 10 years is that the intelligence level in computers will increase dramatically," says Ian Pearson, a futurologist for British Telecommunications' research, technology and IT operations business, BT Exact. "They'll become quite independent and do a lot of things proactively."

The technology would allow employers to dismiss their top IT employees—after draining their knowledge into a database—and then replace them with lower-paid newcomers.

43%
of IT budgets are spent on labor.

SOURCE: Forrester Research

Supersmart machines that perform like virtual IT specialists, making rapid and intuitive decisions on the fly, endanger the jobs of an untold number of skilled professionals. The threat is two-fold. On the one hand, AI systems—should they become commercially viable—may replace grunt IT work by automating many of the tasks currently handled by low- and midlevel workers. Alternatively, or perhaps concurrently, the machines could give even entry-level IT workers instant access to the accumulated wisdom of seasoned—and highly paid—IT pros. "[Less-skilled workers could] do jobs which previously had been beyond them—jobs which they did not have the ability to do before," says Pearson. The technology would allow employers to dismiss their top IT employees—after draining their combined knowledge into a database—and then replace them with lower-paid newcomers.

The Case for Optimism

While there's little doubt that technology will reshape the IT jobscape, change isn't necessarily a bad thing. Compared with unskilled workers, whose jobs began disappearing many years ago, IT professionals have generally proven to be more than willing to adapt to new technologies and employment situations. While emerging technologies will kill many existing IT jobs, it's highly likely that future breakthroughs will arrive during the next few years and require IT expertise in totally new areas.

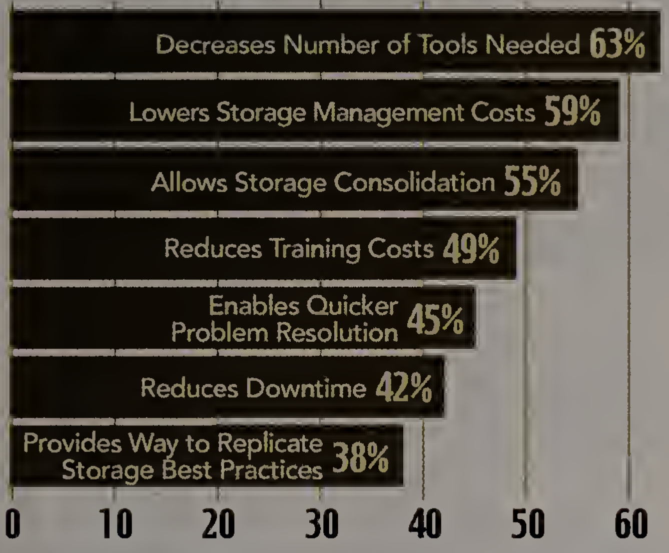
A Sound Storage Investment

Yankee Group report finds users of VERITAS storage management software realize 3-year ROI of at least 200%.

As storage-related expenses chew up ever-larger amounts of IT budgets, IT executives looking for ways to contain storage costs are increasingly turning to a heterogeneous management approach to help them rein in costs while improving performance.

Key Heterogeneous Storage Management Benefits

Percent of Respondents



SOURCE: THE YANKEE GROUP,
2003 SURVEY OF 289 STORAGE DECISION-MAKERS

VERITAS delivers ROI

Customer	3-year ROI	Payback period
Government agency	204%	15 months
Service provider	201%	11 months
Financial services company	205%*	13 months*

* Projected

SOURCE: THE YANKEE GROUP

Download the full report

The Yankee Group report, **"Storage Management Return on Investment from Deploying VERITAS Software"** is available free online. The report contains detailed financial analyses of the three case studies mentioned here, to help you make your own business case for heterogeneous backup software.

Go to: www.veritas.com/offer and enter reference code 4391.

That is but one of the key findings of a recent study by The Yankee Group on storage management return on investment. The Yankee Group, a research firm based in Boston, surveyed 289 IT executives at Global 2000 firms for the study, and also homed in on three users of VERITAS Software storage management tools to determine total cost of ownership and ROI figures for their VERITAS deployments.

The results present a rather dramatic case for the benefits of a heterogeneous storage management approach: A government agency saw an ROI of 204 percent, a service provider realized an ROI of 201 percent and a financial services company expects a return of 205 percent over three years from their respective VERITAS storage management software deployments. The three companies saw a payback period of 15 months or less, according to a detailed financial analysis Yankee Group conducted for each of the three customers.

"All three sites also experienced a marked decrease in the labor costs associated with managing their storage operations, reducing the time necessary to handle routine storage management tasks and vastly improving their ability to manage complex storage environments," according to the study, written by Yankee Group senior analyst Jamie Gruener and sponsored by VERITAS.

Storage budgets make up 10 percent to 20 percent of overall IT infrastructure budgets, prompting more companies to establish separate storage groups within their IT organizations, the study says. Some 48 percent of the companies Yankee Group surveyed have separate storage groups. With that kind of increased emphasis on storage comes more scrutiny of storage costs and interest in measuring the value of storage investments.

Increasingly, enterprises are finding that the ability to manage a multi-vendor storage environment from a common platform brings numerous benefits, including improving productivity for IT administrators. The strategy also reduces vendor lock-in, enabling customers to select management software independently of their hardware platform, and to select the hardware that best fits each specific backup requirement. Additionally, the strategy reduces downtime, cuts deployment time and streamlines management processes, the report found.

"The bottom line: it's easier and more cost-effective when one can manage storage in a heterogeneous manner," the report states, noting the strategy is employed by more than 50 percent of enterprises today. "Pursuing heterogeneous storage management is a strategic imperative this year and beyond."

Both the larger, 289-user survey and the in-depth interviews with the three VERITAS customers showed a core requirement in the storage management buying decision is improving administrator productivity. "Whether it is storage provisioning, managing storage capacity and the storage network, or attending to backups, storage decision-makers describe how adopting new storage management tools has reduced mundane/routine tasks for administrators significantly," the report says.

Yankee Group's analysis of the three VERITAS customers, who provided detailed financial information on the condition that they not be named, illustrates the savings to be had.

The government agency customer operates a main data center with storage growth rates of 100 percent per year. It has 52 UNIX servers running a mix of IBM AIX and Sun Solaris. Using VERITAS NetBackup to back up the servers, and VERITAS Foundation Suite for volume management, the agency estimates it reduced time spent on storage management tasks by 25 percent. Additionally, NetBackup enabled the agency to use a tiered backup configuration and consolidate storage to four tape libraries, eliminating the need for an estimated 11 tape libraries, the report says.

VERITAS' service provider customer, which offers application hosting services for enterprises, had even more stringent storage requirements. The company operates two data centers with a mix of 900 Windows, Linux and UNIX servers with 63TB of direct-attached storage and five SANS with 75 TB of capacity. Using a combination of VERITAS Cluster Sever, VERITAS Database Edition and NetBackup, the company was able to increase uptime to 99.999 percent — the "five nines" level that telephony companies strive to meet. Its 11-month payback period was the shortest of the three customers Yankee Group interviewed.

The third case study focused on a financial services company with a highly transactional environment that includes 20 Sun Solaris servers, a SAN supporting about 10 TB of data and a mix of Hewlett-Packard, EMC and Hitachi Data Systems storage systems. Using the VERITAS Foundation Suite, VERITAS SANPoint Control and VERITAS SANPoint Foundation Suite HA, for failover, the company increased its capacity utilization from 25 percent to 85 percent. It also increased administrator productivity by about 50 percent, the report says.

In its conclusion, the Yankee Group report says customers looking at storage management solutions should consider a number of issues, including the ability to demonstrate productivity improvements as well as a heterogeneous and centralized approach.

"As the results of this ROI case study indicate, VERITAS software can provide significant financial benefits to customers deploying storage management software," the report says. "At the highest level, VERITAS has demonstrated it can save customers significant costs associated with hardware purchase avoidance, reduced labor costs due to higher productivity, as well as reduced downtime costs."

Virtual worlds—ranging from cyberspace walk-through shopping malls to sophisticated training programs that simulate real-world activities and conditions—is one area that could generate a new boom in IT employment by decade's end. "No one out there, except for a very few games developers, are designing virtual environments," says Pearson. "Tomorrow, there will be millions of these people."

Just as yesterday's data-processing departments bear little resemblance to today's IT data centers, it's likely that current jobs will be significantly different from tomorrow's positions. "In 1990, there wasn't a single website designer in the entire world. Now there are hundreds of thousands," notes Pearson. "Those are all people who used to have IT skills in doing something more dull and boring, and they moved up the value chain. Now they get a very good salary for doing website design."

The number of jobs generated by technology may also prove to be a lifesaver for IT professionals. According to the U.S. Department of Labor's Bureau of Labor Statistics, the number of computer software engineers, support specialists, computer and network administrators, systems analysts and database administrators needed by 2010 will grow at rates ranging between 66 percent and 100 percent. A total of 1.5 million new jobs will appear in those areas. While many of the positions could end up in other countries, the sheer number of workers needed—and Forrester's projection of 276,954 computer-related jobs outsourced overseas by 2010—indicates that there will be plenty of work for U.S. IT specialists in the years ahead.

"There's no reason at all to believe that we're going to find lots of jobless people in the IT sector," says Pearson. "If anything, there's going to be a shortage because the new opportunities that are presenting themselves in IT are far greater in volume than the things which are being eradicated."

John Edwards is a technology writer located in Gilbert, Ariz. He can be reached via e-mail at *john@john-edwards.com*.

UNDER DEVELOPMENT

Upright Data Storage

HARD DRIVE TECH | Magnetic data disks—your typical hard drives—have been going through a golden age, with storage densities doubling for many years of the past decade. But the engineers charged with finding evermore clever ways to stuff extra bits into a given square inch of magnetic platter were beginning to encounter the physical limits of current techniques. New advances in Perpendicular Magnetic Recording (PMR) technology, however, may continue that steep density trend for some time to come.

Today, typical hard drives use what is called Longitudinal Magnetic Recording (LMR). With LMR, the magnetic fields that determine whether a bit is on or off lie in the plane of the spinning disk. (Imagine billions of tiny arrows lying on their sides on the disk and pointing either left or right.) PMR shifts the fields so that they point into or away from the disk platter. This reorientation allows for stronger magnetic fields and denser data storage.

Until recently, however, PMR technology required a relatively thick deposit of magnetic underlayer that could not be applied efficiently and rapidly with current production equipment. Recent advances by MMC Technology (a subsidiary of disk maker Maxtor), however, may bring PMR within reach of today's disk manufacturing plants.

"We think we can make it on today's equipment without buying new factories or buying new special machines to do this," says Ken Johnson, vice president of research and development at MMC, noting that in a low-margin business such as disk drives, low manufacturing costs are critical. "It's starting to look to me like this PMR jump can be made to happen with just good engineering in the next 18 months," he says.

MMC is currently touting storage densities of 175GB per platter, 75GB more than the current highest-density commercially available disks, though Johnson says 175GB is only a starting point for PMR. MMC won't commit to drive delivery dates, but Johnson estimates late 2004 or early 2005 as a realistic time frame for the industry.

–Christopher Lindquist

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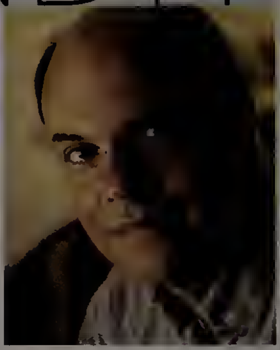

The Year of Web Services

BY ERIC KNORR

The stars will align in 2004 to make Web services a significant success story

WEB SERVICES | Genuinely new technology springs forth from hallowed ground like Cambridge, Palo Alto or Yokohama. These are the places where transistors shrink, where lasers learn new tricks, where sheets of carbon atoms roll themselves into perfect little tubes. Everything else is politics.

I don't mean to disparage the work that engineers do every day. But many would admit, with rare exception, they take scientists' fundamental research and use it to extend the capabilities of established technologies. Where those engineers direct their efforts largely depends on the politics that drive the widespread adoption of standards such as SCSI, Ethernet...or Web services protocols.

A happy confluence of technology and politics has convinced me that this year will be the year when Web services begins to reach critical mass as a low-cost alternative to proprietary middleware. The biggest knocks on Web services have always been security and performance. The two are closely related: Web services communications are text-based, which makes them fat, and they're human-readable streams that poke through firewalls, which makes them a huge security risk. Compression can take care of the fat, but that takes CPU horsepower. So does security—from good old SSL to the forthcoming matrix of XML encryption and authentication standards percolating through Web services standards committees.

Lucky for us MIPS just keep getting cheaper. And with IT budgets starting to loosen, relatively light hardware upgrades should be enough to support networks fast and safe enough for Web services to flourish.

Web services adoption is also already happening in unexpected ways. Salesforce.com, for example, has been begun irritating Siebel to the point where Siebel was forced to offer its own service (and buy a Salesforce competitor, UpShot). And Salesforce's success stems in part from removing the biggest objections to application service providers: integration and customization. And it did that mainly by building Salesforce.com on a Web services platform.

Getting Edgy

Web services security is also rapidly maturing. As XML documents start shooting this way and that inside and outside the firewall, the edge of the enterprise will get blurrier. All over the network, XML firewalls will need to sniff for trouble (intentional or otherwise) and protect the application layer. Several vendors, including Forum Systems and Reactivity, have taken an appliance approach to XML security, offering boxes that act as firewalls and boost performance at the same time. Reactivity's latest model even bakes in a draft version of WS-Security 1.0, a standard that virtually all Web services leaders have accepted.

Much work on such security specs remains, of course, particularly on the horrifically complex problem of authentication and authorization. And there's no getting around the hard labor of developing XML data definitions for integration—which Web services does very little to ease. Where existing middleware or EDI solutions work, nobody will fix them with Web services. But for new integration projects, Web services is already becoming one of the first solutions IT considers. And that acceptance dovetails nicely with boundless enthusiasm for outsourcing, which increasingly uses Web services as its modus operandi.

> A happy confluence of technology and politics has convinced me that this year will be the year when Web services begins to reach critical mass.
> –Eric Knorr

This is nothing less than the start of what Scott Dietzen, CTO of BEA Systems, calls the Web 2.0, where the Web becomes a universal, standards-based integration platform. Web 1.0 (HTTP, TCP/IP and HTML) is the core of enterprise infrastructure. Now, industry politicians have completed another important part of their job and agreed on the basic groundwork for the next phase. Better yet, we even have the horsepower to handle it.

Eric Knorr is executive editor of *InfoWorld*. He can be reached at *eknorr@pacbell.net*.

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Retreat Moderator

Peter Weill

Director, Center for Information Systems Research, MIT Sloan School of Management

The Case Studies

Peter Weill once again presents new findings and case studies from work with hundreds of Global 1000 companies, focusing on three key areas: IT infrastructure for strategic agility, effective business models, and IT governance.

› IT Infrastructure for Strategic Agility

Strategic agility—the ability to implement new business initiatives quickly and cost effectively—will be an increasingly important capability for enterprises in 2004. IT infrastructure is one of the critical platforms required for strategic agility. Investing in the right infrastructure at the right time enables rapid implementation of future electronically based business initiatives and cost reduction of current business processes—i.e., more business value. This session presents a framework for senior executives to view IT infrastructure in business terms and to lead in making investment decisions. Weill illustrates how firms successfully implement and exploit their IT infrastructures with several case studies.

› Do Some Business Models Perform Better than Others?

In an increasingly connected business world the business model—what a firm does and how they make money—is a critical strategic decision. Understanding what business models are used, how they are combined, and which are most successful is important for every senior manager. In addition, firms implementing each model use IT differently—resulting in different IT portfolios. This presentation provides a new and powerful way to analyze a firm's business model and then think about the IT needs.

› IT Governance Workshop

In response to strong interest in last year's session on IT governance, Weill leads a workshop on how top performers govern. He presents case studies and insights from MIT CISR's study of effective IT governance in 256 enterprises in 23 countries. A framework is presented in this workshop to analyze and communicate governance, illustrated with cases studies of top performers.

› Monday's Case Study Workgroups

Monday at lunch we divide into small groups to investigate the link between business strategy and IT infrastructure in a new case study. The case is based on a global multi-business unit firm in the healthcare industry moving from a fully decentralized approach to information technology to providing some firm-wide IT infrastructure. The challenge for your group is to advise the newly appointed CIO. Groups will report back with their recommendations.

The Enterprise Value Award Winners

› Conversations with This Year's Winners

We offer breakout sessions with this year's winning organizations. It's your chance to talk at a more intimate level, discuss their particular case in more detail and take away lessons you can apply to your own organization back home.

- Academic Management Services
- Ace Hardware Corporation
- Chicago Police Department
- Continental Airlines
- Dell Computer
- Guardian Life Insurance Company of America
- Korn/Ferry International
- Pfizer Global Research & Development
- Procter & Gamble Company
- Worldspan LP

› The Value Proposition

Our panel of CIO Enterprise Value Award winners talks about the ongoing difficulty inherent in demonstrating and delivering IT value. How do you convince your CEOs, CFOs and COOs—who may think IT is just a commodity, a utility—that its intelligent application and deployment can and does indeed bring strategic value to the business.

› Monday Night's Gala Awards Ceremony & Dinner

We'll announce the winner of the Grand CIO Enterprise Value Award—and honor all the winners in the industry categories at a black-tie reception, awards ceremony and dinner.

The Peer Networking

CIOs tell us it's as important to have opportunities to meet informally with their peers as it is to participate in the Retreat sessions. We give you more opportunities to meet and learn from more of your peers over three days. And we're happy to hook you up with other attendees or corporate sponsors you'd like to meet.

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WHAT WERE WE Thinking?

Some *CIO* predictions that went awry

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Because making money is a competitive disadvantage?

"Enron takes an entrepreneurial attitude in an industry where most people have their feet stuck in concrete." –Aug. 15, 1999

Today, there's a whole lot of people who'd like to stick a few Enron executives' feet in concrete.

"The EDI Superhighway." –April 1, 1994

Oops.

"A funny thing has happened to the paperless office on the way to the junk heap of faded great ideas. It appears to be making a comeback." –April 15, 1994

Every few years Pat Boone appears to be making a comeback too, but that doesn't mean he should.

"As other businesses learn more about the cost-efficiencies and benefits of fax, many will find that integrating the right mix of fax technology into their corporate profile is a strategic necessity." –Jan. 15, 1994

Unless, of course, this e-mail thing takes off.

"Corporate IS departments generally don't have a lot of competition." –Dec. 1, 1998

Other than IBM Global Services, HP, EDS, Accenture...

"More than a year ago, German software giant SAP sat atop the booming worldwide market for ERP software. Today, startups like i2 Technologies and Ariba are zooming past SAP...." –Oct. 1, 2000

Who's zooming who?

"The day is steadily approaching when we commute to town in helicopters or pilot the smart highways using missile navigation chips in our cars." –June 15, 1994

If you think road rage is bad, try air rage.

"Application development teams increasingly include anthropologists, ethnographers and other social scientists." –Oct. 15, 1996

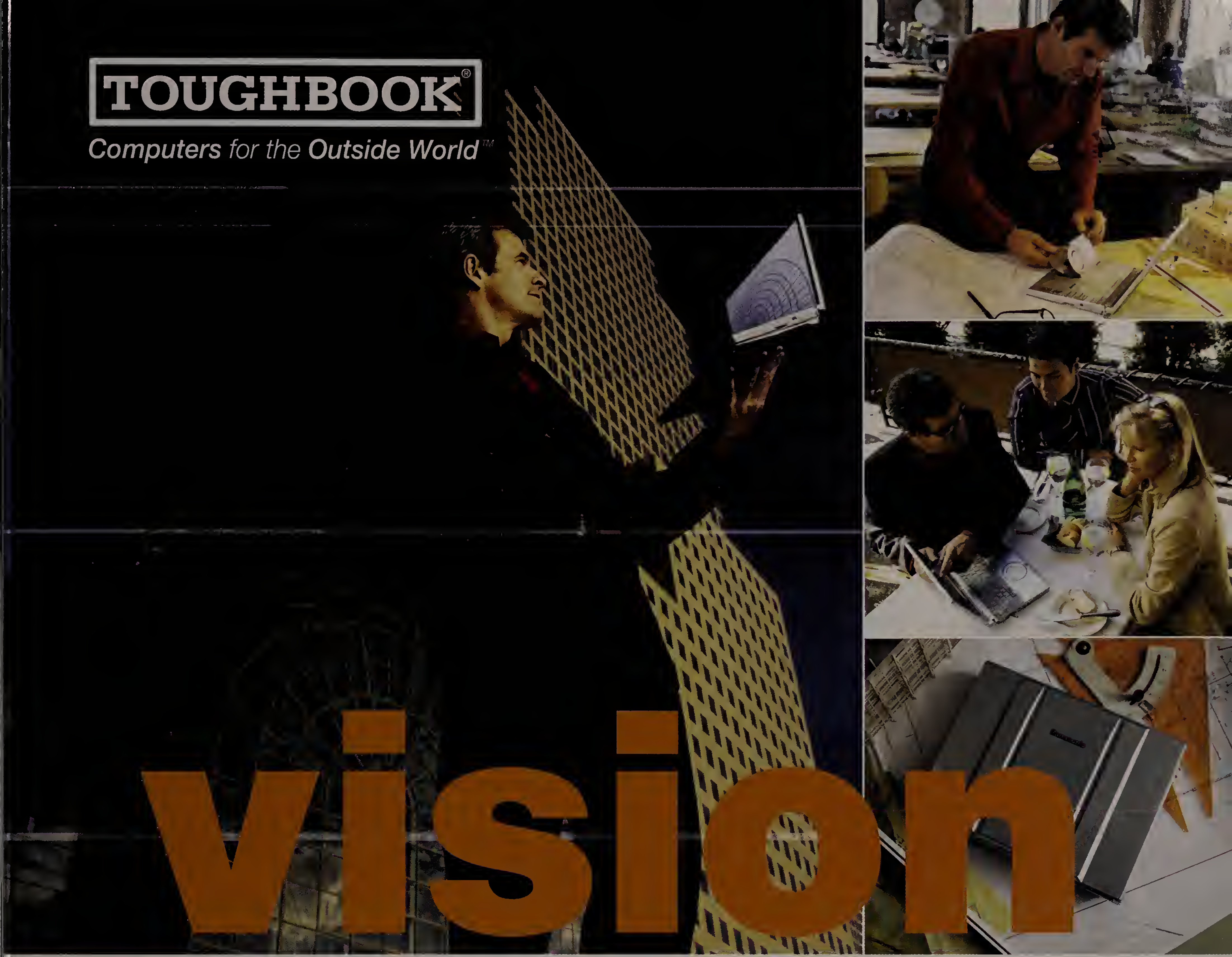
That was before they all got offshored.

"If your IS plans are changing daily in response to the changing landscape, then you're on the right track." –May 1, 1994

Because running around like a chicken with its head cut off is a best practice?

"Wall Street isn't buying the [information] highway hype." –Dec. 1, 1994

Which is why we shrewdly invested in pork bellies.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